



**Connecting for growth:
the role of Britain's hub airport
in economic recovery**

A REPORT PREPARED FOR HEATHROW

September 2011

Connecting for growth: the role of Britain's hub airport in economic recovery

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Foreword

In its *Sustainable Aviation* scoping document, to which responses are due this month, the Government asks whether having a hub airport is important to the UK. This report from Frontier Economics answers that question with an emphatic 'yes'.

It demonstrates the relationship between frequent direct flights and economic growth. It finds that UK businesses trade 20 times as much with Emerging Market countries that have a direct daily flight to the UK as they do with those countries that do not.

The report shows that it is hub airports (as opposed to point-to-point) that are critical to establishing flights to growth destinations; and that because the UK's hub airport at Heathrow is full, Britain is missing out on opportunities for trade and falling behind European competitors.

Paris and Frankfurt already boast 1000 more annual flights to the three largest cities in China than Heathrow. There are 21 Emerging Market destinations with daily flights from other European hubs that are not served from Heathrow. These include destinations such as Manila, Guangzhou, and Jakarta.

The lack of direct flights to Emerging Markets may already be costing the economy £1.2bn a year as trade goes to better-connected competitors. The value of this missed opportunity to the UK economy over the next 10 years could total £14bn.

The centre of gravity in the world economy is shifting and Britain should be forging new links with Emerging Markets. Instead we are edging towards a future as an island cut-off from some of the world's most important markets.

The opportunity for the UK to establish itself as the leader in Europe in its connections to India, China and other important markets still exists. But if Britain is not to lose out to international competitors, we need an aviation policy that recognises the role of a hub airport in supporting growth – and we need it quickly.



Colin Matthews
Chief Executive, BAA

September 2011

1 Executive summary

Heathrow is Britain's only international hub airport. It serves 82 long haul destinations⁽¹⁾ around the world, and these are only financially viable because of Heathrow's success as a hub airport, which allows airlines to supplement domestic demand by also serving transfer passengers.

However, the permitted capacity at Heathrow is fully utilised. This report shows that a major consequence of this is that Britain is missing out on links to Emerging Markets that would help businesses grow – and this economic underperformance of the UK is set to worsen.

This report has been commissioned against the backdrop of the Government's sustainable aviation scoping paper. It examines Heathrow's role as an international hub and its contribution to the UK economy and UK trade. It then examines how that might change in future, and the impact on the British economy if Heathrow fails to maintain its pre-eminent position in Europe in terms of international connectivity.

1.1 Why Britain benefits from having an international hub airport

Heathrow is Britain's gateway to the global economy, and Europe's busiest airport handling more than 65 million passenger trips a year⁽²⁾. The benefits Heathrow brings to Britain include:

- Direct benefits for businesses and those employed in the aviation sector.
- Wider benefits to the British economy from the money that visitors from overseas spend here. Over four million long haul passengers a year arrive at Heathrow to visit Britain. This is 80% of all the long haul passengers that come to the country. The £4.4 billion a year spent by these visitors is crucial to the UK tourist industry, making up more than 5% of total spending in the sector.
- The benefits of trade between British and overseas businesses.

Table 1 shows our estimates of the contribution to GDP and employment from the aviation sector at Heathrow, and the economic contribution associated with spending by foreign visitors who use the airlines' long haul network at Heathrow to visit Britain.

In addition to this, airlines serving Heathrow facilitate the majority of face-to-face business meetings between UK and overseas business people, who do £590 billion a year of business deals adding more than £150 billion a year to UK GDP.

This economic contribution depends on transfer passengers. There are eight million passengers transferring through Heathrow every year. By choosing Heathrow, they sustain the long haul route network and keep Britain connected.

⁽¹⁾ At least once a day

⁽²⁾ Passengers each typically make two trips through the airport, while a passenger transferring through an airport is recorded as two trips for each transfer they make through the hub airport.

Table 1. The benefits to the British economy of aviation at Heathrow, and foreign long haul visitors' spending

	GDP contribution	Employment
Heathrow aviation	£3.4 billion	50,000
Long haul visitor spending	£6.1 billion	130,000
Stop-over passenger spending	£1.6 billion	40,000
Total	£11.1 billion	220,000

Source: Frontier Economics

Note 1: Our estimate of employment is of direct employment in the aviation sector as defined by Annual Business Inquiry. There are around 76,000 people employed at the airport and at Waterside across aviation and related sectors, such as hotels, catering, and other transport providers

Note 2: This table does not include the impact of spending in the UK by visitors arriving on short haul flights.

Heathrow's contribution to the British economy goes far wider than the direct contribution it makes to the aviation sector. By connecting Britain to the global economy, Heathrow plays a vital role in the economic success of the country as a whole.

1.2 Routes will be lost from the network at Heathrow over time

In recent years, short haul routes have been squeezed out of Heathrow. That puts pressure on the number of transfer passengers, potentially endangering long haul routes.

Our analysis suggests that around three quarters of the long haul routes operating from Heathrow carry a sufficient number of transfer passengers to imply that those services might not be viable without them. A small number of routes at Heathrow carry very high proportions (up to 80%) of transfer passengers. The routes most vulnerable to a decline in transfer passenger numbers are shown in Table 2. This provides examples of the first routes that might be lost at Heathrow if transfer passengers are squeezed. UK passengers who use these routes would then be forced to transfer through another hub airport, or not make the trip.

Table 2. Long haul routes most at risk if short haul at Heathrow is further eroded

	Transfer passengers	Heathrow's share of passengers transferring through a major European hub airport
Hyderabad	80%	39%
Edmonton	73%	100%
Chennai	72%	30%
Mexico City	61%	8%
Montreal	56%	16%
Calgary	56%	37%
Vancouver	52%	46%
Ottawa	52%	41%
Luanda	52%	15%
Buenos Aires	50%	6%

Source: Frontier Economics analysis of IATA Airport IS data

1.3 The UK is missing out on international connections

The Government recognises the vital importance to economic growth in the UK of developing trade links with Emerging Markets. However, this report shows that Britain is currently missing out on potentially viable aviation links to those markets – and this gap is likely to grow.

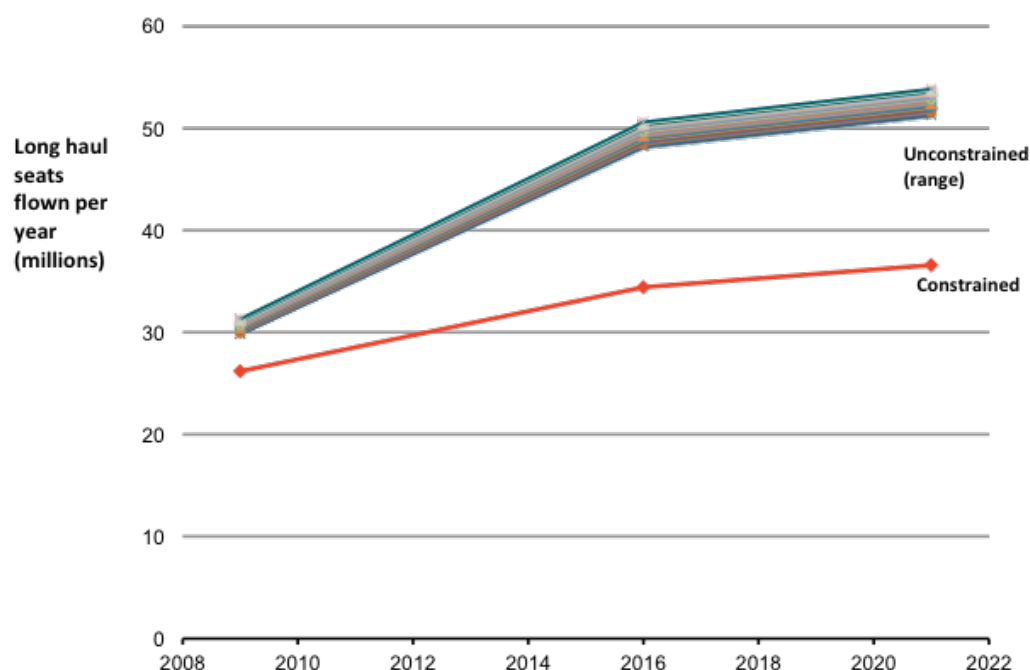
Our analysis shows that as a consequence of these constraints at Heathrow airlines are unable to expand their route networks to serve growing international demand. This is not the case at competing European hub airports. **We predict that as a result those airports will push Heathrow into third place in Europe within the next ten years.**⁽³⁾

Heathrow could serve far more destinations than it currently does. This connectivity gap includes 45 long haul destinations that could be viably added to the airlines' route networks at Heathrow, including 15 in Emerging Markets, while the frequency of service on existing routes could be enhanced.

⁽³⁾ In terms of the numbers of passengers flying and airline capacity flown.

Figure 1 shows our predictions to 2021 for passenger demand and service increases at Heathrow with its current capacity unchanged (the constrained forecast); and a range of predictions for what could be if its operating capacity were not constrained (which we call the unconstrained forecast). A detailed description of the assumptions we have made in these forecasts is provided in Section 6.

Figure 1. Heathrow passenger forecast



Source: Frontier Economics

But this is not simply an operational constraint on airlines operating at Heathrow: it is constraining the development of business relationships between the UK and the fastest growing markets in the world.

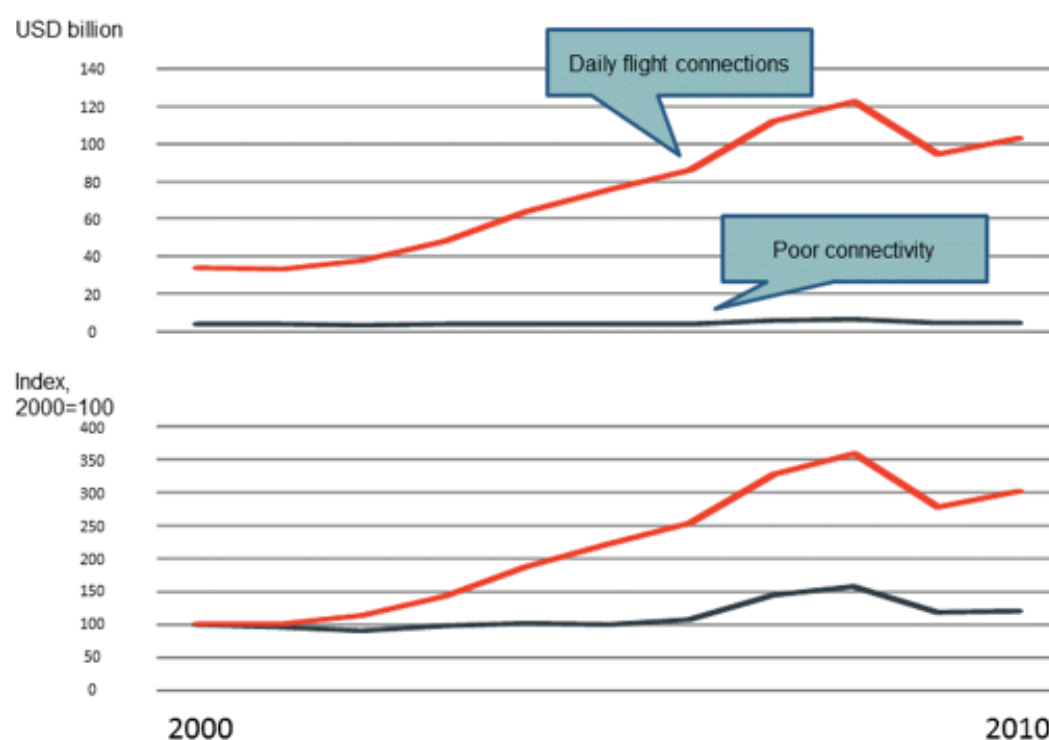
1.4 UK trade with Emerging Markets will continue to be hampered by poor connectivity

The volume of trade between the UK and the rest of the world has grown rapidly over the last ten years. Around half of all the increase has been due to increased trade with Emerging Market countries. Over the next ten years, the IMF world GDP forecasts indicate that the eight largest Emerging Markets will account for more than half of worldwide GDP growth. UK businesses have the opportunity to grow their revenues by trading with businesses in these fast growing countries.

However, Britain risks being cut off from global growth because these markets are not well served by airlines at Heathrow, and there are few if any opportunities to improve connectivity with these Emerging Markets in the future. This is because current capacity constraints mean that new routes can only be added if existing routes are cut.

There are very clear correlations between the levels of trade and connectivity. Figure 2 shows this for UK trade with the eight fastest growing Emerging Markets, where **UK businesses trade 20 times as much with countries where there are daily flights than with those with less frequent or no direct service.**

Figure 2. UK trade is greater and grows faster with Growth Economies that have daily flight connections with Heathrow



Source: Frontier Economics

This connectivity is not the cause of the UK's success as a trading nation, but it is a vital and necessary contributor to it. Without good connectivity trade links are unlikely to flourish and other economies, not facing the same constraints are likely to step in and fill the gap.

The scale of the national and regional economy suggests that Heathrow could support a much larger route network than it does. **We estimate that the value of UK trade could be increased by around £1.2 billion a year, if there were capacity at Heathrow to accommodate the viable Emerging Market routes that we have identified.** This estimate includes adjustments for the unique characteristics of the Emerging Market countries, such as political institutions and historic cultural and trading links. We expect this trade gap to widen by around a quarter to £1.6 billion a year by 2021, as London becomes a less competitive place to do business relative to Frankfurt, Paris, Amsterdam and Madrid.

1.5 The race for connectivity isn't over

Other European hubs are currently winning the race for connectivity. There are 25 Emerging Market destinations with daily flights from other European hubs, and 13 more with at least a weekly connection, that are not well served from Heathrow.

But it is not too late. Future increases of capacity at Heathrow would, we expect, lead to direct services being introduced to many of these places. There are also many more cities in Emerging Market countries that are not yet connected directly to other European hub airports despite their enormous populations and economic growth potential over the next few years.

As an example, Table 3 shows the ten largest Chinese cities, their populations and predicted population growth, and their connectivity with Western Europe. The five Chinese cities that are not yet connected to a Western European hub airport have a combined population of more than 30 million people.

Table 3. Population of 10 major Chinese cities, and connectivity with Western Europe

City	Population (millions)		Connectivity (departing flights per year)				
	2007	2025	LHR	AMS	FRA	CDG	MAD
Shanghai	15.0	19.4	621	589	1110	1323	-
Beijing	11.1	14.5	698	658	1032	964	104
Guangzhou	8.8	11.8	-	311	211	290	-
Shenzhen	7.6	10.2	-	-	-	-	-
Wuhan	7.2	9.3	-	-	-	-	-
Tianjin	7.2	9.2	-	-	-	-	-
Hong Kong	7.2	8.3	3,539	720	778	1,145	-
Chongqing	6.5	8.3	-	-	-	-	-
Shenyang	4.8	6.2	-	-	364	-	-
Dongguan	4.5	6.2	-	-	-	-	-

Source: Frontier analysis of UN and Capstats data

This makes clear that there are still many more destinations and trade routes that could be opened up to the UK, and for the country to make better use of the comparative advantage it has at Heathrow.

1.6 Implications for aviation policy

Aviation connectivity at Heathrow plays a vital role in supporting Britain's prosperity by fostering international trade, and it could play an even more important role in future. But realising that potential is dependent on a policy framework which promotes and protects the comparative advantage which Britain enjoys from having a hub. This is an urgent issue which the Government must address as it seeks to define its aviation strategy.

In its scoping document, *Developing a sustainable framework for UK aviation*, the Government tackles this issue head on, asking whether it is even necessary for the UK to have a hub airport. This report shows there is a direct correlation between connectivity through a hub airport and Britain's trading performance with Emerging Markets. This shows not only the importance of protecting and promoting a hub, but that doing so will directly support the Government's ambitions to nurture an export-led economic recovery and put the UK back on the path to sustained growth.

1.7 Key findings

- 76,000 people work at Heathrow airport, including around 50,000 full time in the aviation sector. A further 180,000 jobs are supported across the UK by the spending of overseas residents arriving on long haul flights at Heathrow. The long haul routes these visitors use at Heathrow are not viable at other UK airports.
- London is connected to 82 long haul destinations by airlines offering daily flights or better at Heathrow.
- Heathrow handles 80% of all long haul passengers that come to the UK.
- Heathrow welcomes 4 million long haul visitors from overseas a year to the UK, who spend £4.4bn while visiting.
- 20% of long haul passengers from overseas at Heathrow come to Britain on business: The airlines' route networks at Heathrow help sustain the £600bn a year of trade between the UK and the rest of the world.
- Heathrow serves as a hub, facilitating around 8 million transfers a year⁽⁴⁾.
- Without these transfer passengers the majority of long-haul routes at Heathrow would face cuts in frequency and / or substantial fares increases. Some routes would not be viable at all.
- In addition, we estimate that around 2.5 million passengers transferring through Heathrow stopover in London, and spend, on average, more than £500 each per visit.
- Because of capacity constraints, long haul routes have squeezed out short haul ones at Heathrow: Heathrow currently serves just 46 short haul routes, compared to over 70 served by Frankfurt and Paris⁽⁵⁾. Furthermore, airlines at Heathrow are losing transfer passengers to carriers based at other hub airports. The UK economy would be boosted if these passengers could be served via the UK instead.
- We have conservatively predicted that Heathrow could increase its share of European transfer passengers from 16% to 21% if it was able to fulfil its potential⁽⁶⁾.
- 45 destinations could be viably added to the route network at Heathrow, including 15 routes to Emerging Markets.
- There are many Emerging Market destinations that airlines at Heathrow cannot serve because of insufficient airport capacity. There are 25 Emerging Market destinations with frequent flights from other European hubs, and 13 more with at least a weekly connection that are not well served, or not served at all from Heathrow.
- These Emerging Markets are where the majority of world economic growth will be for the foreseeable future. We estimate that UK businesses are missing out on £1.2 billion a year now, and that this trade gap will widen to at least £1.6 billion a year by 2021, as these countries' economies continue to grow.
- If Heathrow's capacity remains constrained, Heathrow is likely to lose its position as Europe's busiest airport by 2021, falling to third behind Frankfurt and Paris Charles de Gaulle, with Amsterdam Schiphol close behind.

2 Introduction

This study was commissioned by BAA Heathrow to assess the economic contribution of airline operation at Heathrow and to compare this with the economic impacts of major hub airports in other European countries, namely: Paris Charles de Gaulle, Frankfurt, Amsterdam Schiphol, and Madrid Barajas airports.

The report is structured as follows

- **Section 3** provides context for the report, covering the economic contribution of the aviation industry to the UK economy, the role of hub airports, and the importance of transfer passengers to securing long haul connectivity between Britain and the rest of the world.
- **Section 4** compares the level of connectivity generated by hub operations at Heathrow airport, and that at the other four major Western European hubs.
- **Section 5** assesses the importance of trade to the UK, and how world trading patterns are shifting towards Emerging Markets. This shift makes links with these markets increasingly important over the next ten years, as they are predicted by the IMF to account for more than half of world economic growth over the next ten years.
- **Section 6** presents our forecasts of how air passenger travel will increase over the period to 2021. This includes an assessment of the way that the lack of hub capacity at Heathrow will exacerbate the UK's existing connectivity gap, and how this is likely to adversely impact on trade with the fastest growing Emerging Markets.
- **Section 7** concludes.

⁽⁴⁾ We estimate that 8 million transfers are made through Heathrow airport each year. Each transfer is recorded as two passenger trips – one into the airport and one out. There is some dispute about how many passengers transfer at different airports. For example, the CAA's surveys suggest the figure is more than 30% at Heathrow.

⁽⁵⁾ The numbers of short haul routes are those with at least 3 flights a day in each direction.

⁽⁶⁾ The base estimate of 16% is from our analysis of IATA airport IS data.

3 Background

3.1 Aviation, jobs and prosperity

The aviation industry makes a substantial contribution to Britain's prosperity – both directly and indirectly. More than a quarter of a million people are employed directly in the UK aviation industry, and the economic contribution of the industry has been documented by several previous studies and is apparent in National Accounting data, such as that summarised in Table 4. But the importance of aviation to Britain's economic prosperity goes far wider, with international connectivity underpinning Britain's position in the global economy. Rather than seeking to duplicate previous work on the direct economic value of aviation, this report sets out the wider economic benefits delivered by the industry at Heathrow.

Heathrow facilitates 80% of all long haul arrivals into the UK. In turn these people spend £4.4 billion each year in the UK, contributing substantially to the success of the tourist industry. Furthermore, more than 20% of long haul passengers arriving at Heathrow are on business. They spend £1.6 billion while visiting the country which represents incremental revenue for the British economy, as well as facilitating business relationships and making London a favoured location for international business headquarters and as a conference destination.

There is also a thriving stopover market in London, even though it has not been as actively promoted as in Dubai, Hong Kong, and Singapore. This market involves passengers who are travelling from one place to another via Heathrow, and then who spend time and money on a short visit to London. The difference between the number of transfer passengers recorded in IATA's ticket sales database, and the number of passengers identifying themselves to the CAA's survey takers as transferring at Heathrow suggests that as many as 2.5 million passengers a year may be stopping over in London in this way. Their spending of up to £1.3 billion is incremental to the tourist industry, and adds up to £1.6 billion to GDP through the supply chain, and secures jobs for around 40,000 people in the UK.

At the same time, the direct contribution of aviation to the UK economy must not be understated. Employment in the aviation industry accounts for around 1% of the total UK workforce. These are high value jobs contributing 2% of UK Gross Value Added; this is double that of the average UK employee, as can be seen in Table 4.

Table 4. Jobs in the UK aviation industry

Sector	UK jobs	Gross value added per worker	% of total UK employment
Air transport	93,000	58,000	0.4
Ancillary services	49,000	82,000	0.2
Manufacturing	87,000	79,000	0.3
Maintenance	25,000	56,000	0.1
Aviation total	254,000	70,000	1
Total UK economy	26 million	35,000	100

Source: Annual Business Inquiry, 2008

The direct contribution to GDP of employment in the sector is around £18 billion a year. We estimate that the direct contribution from Heathrow is at least £6.3 billion a year, estimated on the conservative basis that 35% of all incoming passengers to the UK arrive at Heathrow. Moreover, there is a cluster economy that has built up around Heathrow airport, where aviation related businesses are concentrated, so we would expect that the contribution at Heathrow may be higher.

3.2 Why it matters to have an international hub

Successful hub airports play a special role in an economy by underpinning a country's connectivity to long haul destinations around the world. This connectivity with distant markets facilitates face-to-face business meetings which are crucial to doing business effectively.

Heathrow is unique amongst UK airports, in that it is the only UK airport which supports a significant long haul route network through its operation as a hub. Airlines' long haul operations at Heathrow provide daily connections between London and 82 destinations. Many of the routes, and the service level of others, are only financially viable because of the service that Heathrow provides to transfer passengers.

Heathrow is a successful hub airport. There are around eight million transfers through Heathrow a year. This is similar to the levels handled by other major European hub airports, despite Heathrow having a smaller short haul network than the other hub airports, due to its capacity constraint. Many airports around the world are configured so as to allow hub operations, but much of the increase in flying over the last 15 years has been with low cost carriers (LCCs), which operate a point-to-point business model, and most of these carriers do not offer their customers the facility to transfer through a hub. LCCs do not typically offer long haul services. So, although many airports have been designed to allow hub operations, they do not operate as hubs in practice, nor are they likely to in the future.

3.3 Essential characteristics of a hub airport

For an airport to operate successfully as a hub, it must have:

- A Network Carrier or airline alliance choose to base sufficient aircraft there to operate a hub and spoke strategy;
- A large route network. This network does not necessarily have to be served by a single airline or alliance;
- A suitable geographical location, allowing airlines to cost effectively serve passengers transferring through the hub airport between large markets; and
- Appropriate facilities to handle efficient connections for passengers, their baggage and cargo transferring through the airport and to accommodate the variability in aircraft, peak flows and passenger types that come with hub operation.

For the hub airport to be sustainable it is also desirable for it to have:

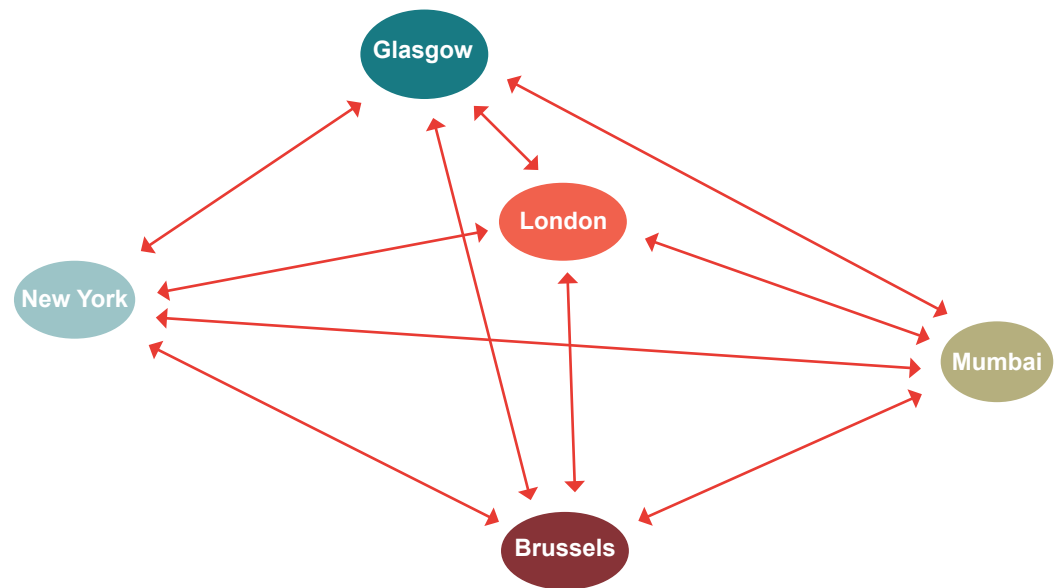
- Strong local demand for travel to and from the city where it is based; and
- Adequate runway capacity for the airlines to operate waves of arrivals and departures. This offers short transfer times to passengers changing flights at the hub airport and the maximum number of efficient connections for a given network.

3.4 Why long haul airlines use hub airports

The hub and spoke model of Network Carriers has developed in response to market conditions and passengers' needs. Airlines face fixed costs per aircraft base and fixed costs per route they serve (including route marketing costs). By pooling demand from transfer passengers from across the UK and beyond with point to point passengers, Network Carriers' route networks are sustained. Edinburgh's, Belfast's and Manchester's populations alone cannot sustain demand for a daily flight to Sao Paulo for example, but by pooling that demand from around the UK and beyond, a Network Carrier at a hub airport can viably serve the route.

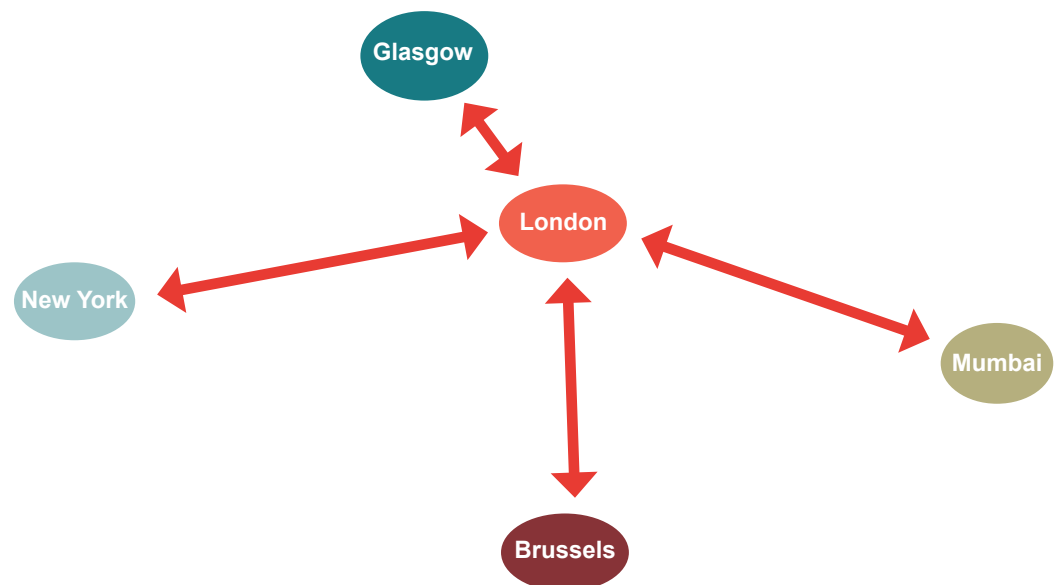
Consolidating passengers onto fewer, denser routes reduces the average level of fixed costs per passenger carried. This reduces average cost per passenger, which feeds through into lower fares, and can generate higher passenger numbers.

A stylised point-to-point network is illustrated in Figure 3 below. In this illustration there are five cities, each with an airport. There are people who want to fly from each one of the five cities to all of the other four; hence airlines operate services on all the ten possible routes.

Figure 3. Stylised point to point network

Source: Frontier illustration

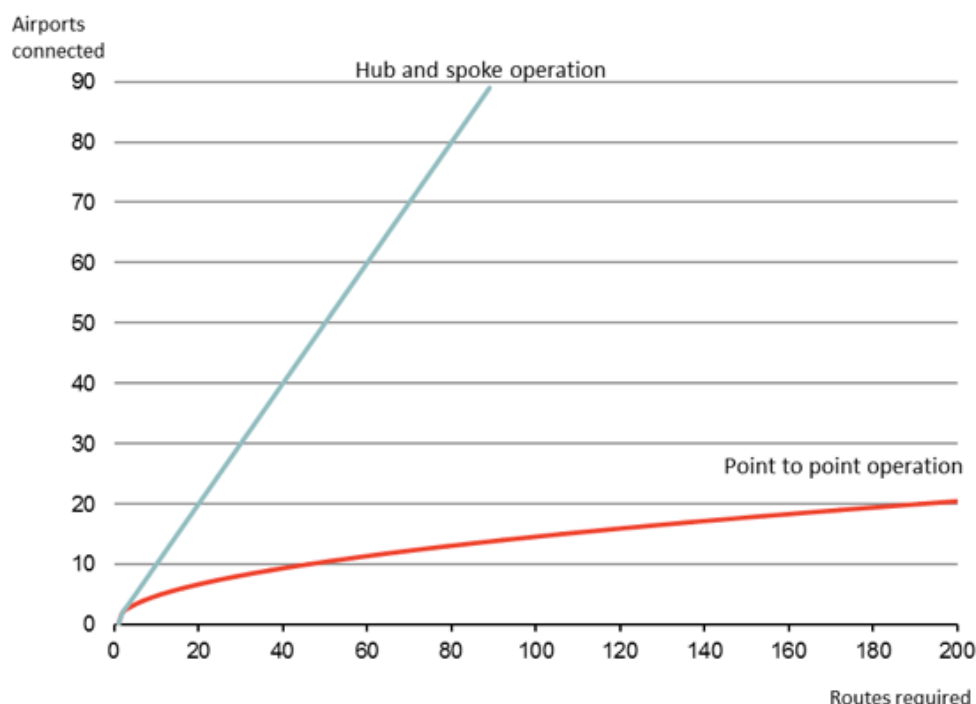
In contrast these five cities could be served in a hub and spoke network with only four routes, all originating from the hub airport, at London. This is shown in the illustration in Figure 4.

Figure 4. Stylised hub and spoke network

Source: Frontier illustration

As the number of destinations served from a hub airport increases, the difference between the number of routes offered through the hub, and the number needed to provide point to point service between all of the destinations multiplies. This is shown in Figure 5.

Figure 5. Network effect from hub and spoke airline operation vs point to point service



Source: Frontier illustration

3.5 The benefit for British passengers

It has been argued that the transfer passengers upon whom a hub airport depends contribute no more to the UK than “the price of a cup of coffee”⁽⁷⁾. However, this argument overlooks the significant benefits delivered to passengers and the wider economy as a result of the network effects of a hub. Hub and spoke networks are not only a benefit to airlines; passengers benefit too. Passengers who want to fly to or from the hub airport benefit from:

- Better connectivity, because many routes and service levels would not be viable if other passengers were not transferring through the hub. As a result, passengers enjoy a wider range of routes and greater frequency on existing routes.
- Lower fares, because sharing their services with spoke passengers (those wanting to travel between two spoke destinations) spreads fixed costs over a larger number of passengers and leads to lower average fares⁽⁸⁾.

⁽⁷⁾ “The economic value of transfer passengers is hotly disputed - after all, they often spend only the price of a cup of coffee in the UK”, David Cameron, Evening Standard, 16 June 2008

“Transfer passengers, for whom...a hub would be built, spend no money in Britain, at least little beyond the price of a cup of tea”, Bob Ayling, Sunday Times, 4 May 2008

⁽⁸⁾ Hub passengers become the beneficiaries of a “network effect”: increased demand from spoke passengers reduces the costs of serving hub passengers, which feeds through into lower prices and higher demand for hub services. Furthermore, airlines typically operate with falling incremental costs per passenger (because greater passenger density allows the use of larger, aircraft with lower average costs per passenger). So increasing passenger numbers on the hub routes reduces marginal costs to all passengers (as well as average costs), which accentuates the network effect.

Passengers wanting to fly between two spoke destinations also benefit despite the fact that they now may not have a direct flight (although that may also never have been a viable option) and have to route via a hub, because it can have a dramatic effect on the frequency of service they can choose. For example, considering the diagram above, if the demand to fly between Glasgow and Mumbai is small, an airline serving that route might justify (say) one flight a week in a small (therefore expensive) aircraft. But if the demand to fly from London to both Glasgow and Mumbai is high (several large flights per day), the airline can serve passengers on the Glasgow – Mumbai route via the hub in London with a several-times-per-day frequency using larger, cost-efficient aircraft.

The hub and spoke model offers passengers significant improvements in flight frequency. Furthermore, network carriers operating through a hub airport should not result in any passengers being worse off. Hub and spoke services will only replace direct point-to-point services at the spoke airports if the improvement in flight frequency more than compensates for any increase in fare and the loss of a direct route⁽⁹⁾. If it does not then point-to-point services will continue, alongside or instead of hub and spoke services⁽¹⁰⁾.

3.6 Heathrow: a strategic national asset

Heathrow is a strategic national asset for the UK – not just because aviation provides high value adding employment opportunities, with much of the concentration of this work located in an economic cluster around Heathrow airport, but because of the value of the international connections that it provides.

Heathrow is unique among UK airports in that it successfully provides for airlines to operate a hub and spoke network which viably serves both short haul and many long haul destinations.

Hub and spoke networks provide an efficient operating approach for airlines and they benefit passengers by providing better connectivity, and lower air fares. This is especially true for long haul services but, of course, passengers transferring onto long haul services at a hub usually have travelled on a short haul service first.

In the following section we set out how each of the major European hubs has developed so far, focussing on the connectivity that each provides with world markets.

⁽⁹⁾ This will occur so long as there is capacity available, and access is liberalised.

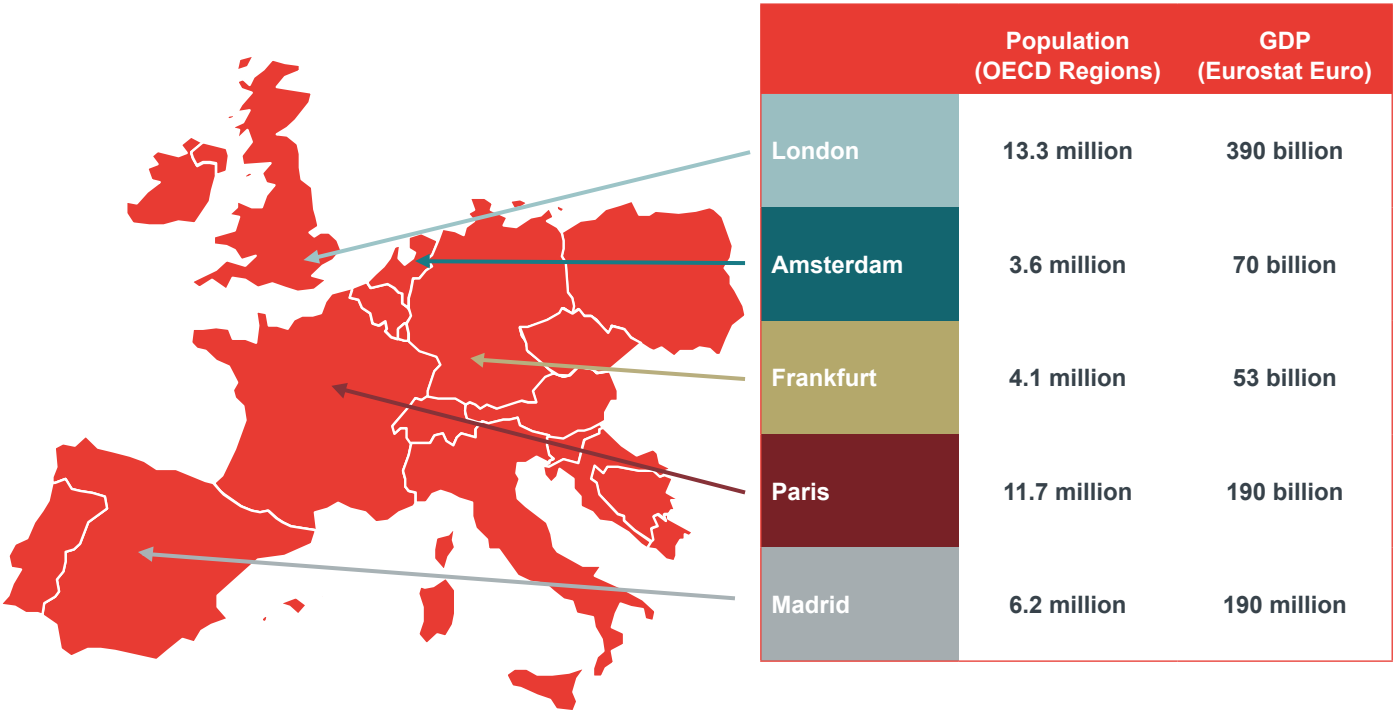
⁽¹⁰⁾ Airlines might also segment the market by offering lower frequency lower cost services if there is a market segment at the spoke prepared to accept a low frequency option.

4 Losing the race for international connectivity

Britain is an island nation, but has thrived because of its connections to the global economy. Today, aviation plays a crucial role in connecting Britain to global markets. And with Emerging Markets responsible for a significant share of world growth, Britain’s position in the race for international connectivity will play a vital role in how our economy develops in future.

London enjoys many advantages which mean it is well placed to connect Britain to the global economy. The population of London and the size of its economy mean that airlines can tap a substantial pool of local demand. And London’s geographical position on the great circle route to North America mean that it is well placed to attract transatlantic transfer passengers. London is ideally placed to be Europe’s premier hub airport location, as the comparison with other hub airports in Figure 6 shows.

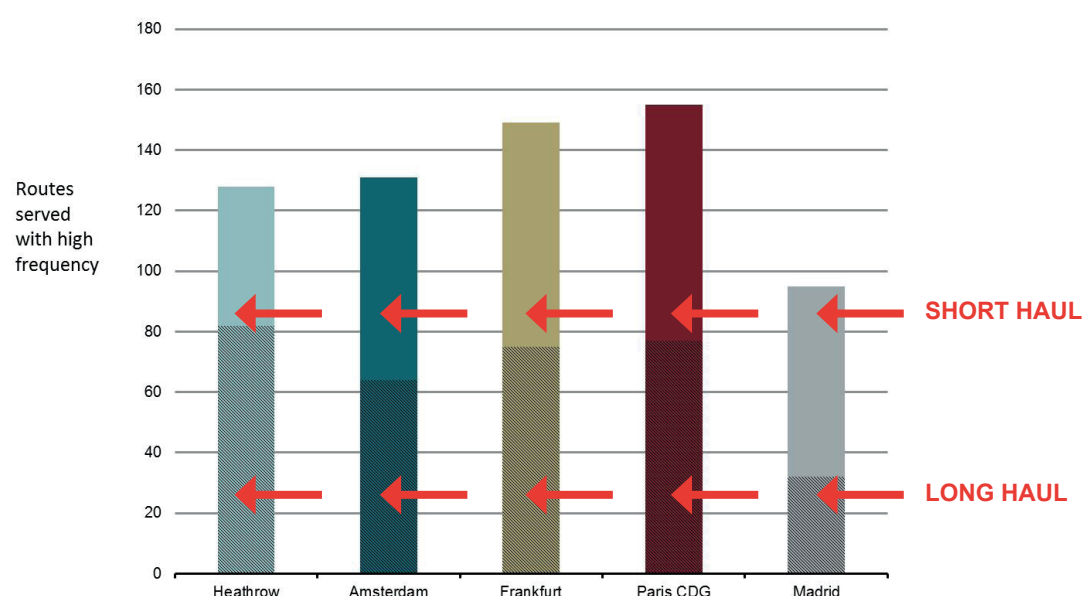
Figure 6. London’s population and economic clout position it to be Europe’s premier hub airport location



Source: Eurostat

But in reality, London is punching below its weight. We would expect that Heathrow could support a significantly larger route network than the other hubs because the economy and population in London are so much greater than those of the cities supporting the other major hub airports in Europe. But Figure 7 below shows that this is not the case. That is, the number of routes with frequent services is not greater at Heathrow than elsewhere⁽¹¹⁾. This is primarily a consequence of the constraints on runway capacity, and the permitted number of air transport movements (ATMs) each year, rather than a lack of underlying demand. This fact is demonstrated by airlines seeking to expand and introduce new services at Heathrow through the slot co-ordination procedure.

Figure 7. The short haul squeeze: destinations with frequent connections to European hub airports



Source: Frontier analysis of schedules data from Thompson Capstats

Note: Frequent connection is defined as a minimum of three short haul or one long haul service a day in each direction

Heathrow serves a similar number of long haul routes as Charles de Gaulle and Frankfurt. Amsterdam Schiphol serves slightly fewer. Madrid Barajas serves far fewer, but starts from a lower base, and has the potential to grow rapidly, particularly if it is developed as a hub by the new International Airlines Group formed by the merger of BA and Iberia. In contrast, the short haul route network at Heathrow serves far fewer routes than the other European hubs. However, the service frequency on Heathrow's short haul routes is substantially greater, as can be seen in Table 5 below (in which density is defined as flights per route per day). Similarly, Heathrow's long haul routes also provide much greater frequency of service, on average, than at the other hubs.

⁽¹¹⁾ We have defined "frequent services" as being at least a daily service between Heathrow and long haul destinations, and at least three flights a day between Heathrow and short haul destinations.

The greater service frequency at Heathrow reflects

- the fact that base demand at Heathrow, particularly from business users, requires higher frequency services
- the business strategy of the airlines operating at Heathrow, particularly home based carriers - which have to choose between the number of destinations it offers and the frequency of flights within the capacity available and thus tends to 'sacrifice' destinations for frequency over time to remain competitive against less constrained network operators elsewhere

Table 5. The benefits to the British economy of aviation at Heathrow, and foreign long haul visitors' spending

	LHR	AMS	FRA	CDG	MAD
Short haul					
Routes	46	67	74	78	63
Seats	20.9m	15.8m	20.2m	21.4m	25.3m
+/(-) seats since 2005	2.0m 9%	0.3m 3%	(0.6m) 4%	1.2m 10%	0.4m 9%
Density	12.1	7.8	8.2	8.8	10.9
Long haul					
Routes	82	64	75	77	32
Seats	25.2m	9.2m	13.4m	14.0m	5.3m
+/(-) seats since 2005	(2.8m) (12%)	0.3m 2%	(1.3m) (6%)	0.2m 1%	0.7 3%
Density	4.3	2.0	2.6	2.6	2.7

Source: Frontier analysis of schedules data from Thompson Capstats

Over the last five years capacity has continued to increase at the hub airports with the exception of Frankfurt⁽¹²⁾, in spite of the recessionary economic environment. At CDG, MAD, and AMS there has been route and capacity expansion in both long haul and short haul services.

Within the available capacity, the airlines with access to Heathrow choose to operate the best route network that they can. In contrast to the experience at the other hub airports, Heathrow has seen an increase in long haul routes and capacity, at a cost of reduced short haul connectivity at the airport. This indicates that long haul routes are slowly squeezing short haul routes out of the hub airport.

⁽¹²⁾ Frankfurt airport has also been capacity constrained in recent years at peak times of day though this will be reduced with the opening of a new runway there in 2011.

As routes get squeezed out, the pool of transfer passengers that can be served gets smaller. In turn, this reduces the economic advantage of having a hub in the UK by pushing up prices for passengers and reducing short haul connectivity for those wishing to travel on from Heathrow. By contrast, airlines operating at the other western European hubs are not forced to substitute between profitable routes. The consequences of this are that:

- long haul routes get established at other European hub airports when they could have been viably served from Heathrow; and consequently
- the UK economy, and the economy of London in particular, becomes relatively less competitive as connectivity declines and profitable routes are established by Britain's European rivals rather than being located here

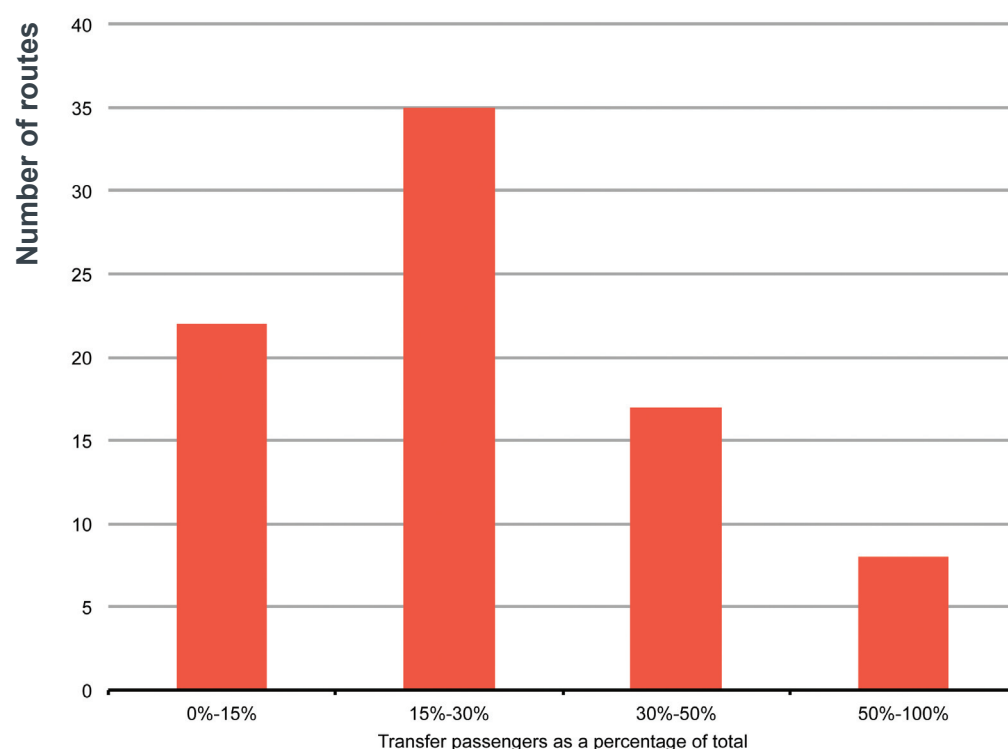
This is borne out by the fact that over 60% of transfer passengers flying through Heathrow travel to or from mainland Europe. Only a small number of these passengers would substitute to an alternative mode of transport to reach Heathrow if the short haul link was unavailable. Most would use one of the other European hubs. Indeed, of the six short haul destinations which have lost frequent connectivity to Heathrow since 2005⁽¹³⁾, for four of these it would be highly impractical to reach Heathrow by surface transport. Transfer passengers from these destinations have therefore been lost.

Many long haul services in the UK are only sustainable because Heathrow operates as a hub airport. This phenomenon of more profitable routes squeezing out the less profitable ones is not sustainable in the long run. In Britain most long haul routes are only viable at current levels of frequency because the airlines service transfer passengers. Many long haul routes would cease to be viable if an airline were to lose 10–20% of revenue on a route, by no longer serving transfer passengers⁽¹⁴⁾. The histogram in Figure 8 below shows that the vast majority of long haul flights at Heathrow carry more transfer passengers than this.

⁽¹³⁾ These are Shannon, Malaga, Eindhoven, Rotterdam, Leeds/Bradford and Durham.

⁽¹⁴⁾ As this is more than the typical operating margin of Network Carriers.

Figure 8. Long haul passengers transferring at Heathrow make those routes economically viable



Source: Frontier analysis of IATA Airport IS data

If Heathrow served fewer transfer passengers, the UK's long haul connectivity would be made substantially worse as a consequence. In that situation the consequences would be:

- some routes would disappear altogether;
- the frequency of service on the busiest routes would be cut; and
- airfares for UK based passengers could rise substantially.

4.1 The routes that are most at risk

The long haul routes that will be most at risk from further erosion of the transfer passengers from Heathrow are shown in Table 6 below. These are the routes at Heathrow that are most heavily reliant on transfer passengers. If these flights were to be lost from Heathrow, other hubs would probably pick up the transfer passengers or add the service as the majority of the passengers do not start or end their trips in London. This would increase the competitive advantage of the economies surrounding the hub airport, which takes on the service, relative to that of London because the connectivity at the competing hub airport would be improved.

Table 6. Long haul routes most at risk if short haul at Heathrow is further eroded

Route	Transfer passengers	Heathrow's share of passengers transferring through a major European hub airport
Hyderabad	80%	39%
Edmonton	73%	100%
Chennai	72%	30%
Mexico City	61%	8%
Montreal	56%	16%
Calgary	56%	37%
Vancouver	52%	46%
Ottawa	52%	41%
Luanda	52%	15%
Buenos Aires	50%	6%

Source: Frontier analysis of IATA Airport IS data

A second consequence of further erosion of the short haul network at Heathrow would be to make it much harder to introduce and establish services to the fastest growing economies, because new routes to Emerging Markets rely most heavily on serving a broader range of origins and destinations. Airlines already face this commercial reality in looking at new routes from Heathrow and find it harder than elsewhere to justify opening a new destination.

This would adversely impact on London's future attractiveness as a world city. We provide further detail about the importance of these markets in Section 5, and the market potential for these being served from Heathrow, if its capacity constraints were reduced, in Section 6.

4.2 How Britain is missing out on international connections at Heathrow

Heathrow provides for airlines to run the largest long haul route network of any of the Western European hubs, yet it is still not reaching its potential in terms of how many destinations it could serve.

Figure 9 shows the share of transfer passengers that each Western European hub handles, for routes with more than a million passengers transferring at a hub. Despite having a reduced short haul network feeding long haul routes at Heathrow, airlines are clearly able to offer attractive service options, and as a result are handling substantial numbers of passengers on these well-established routes, with the exception of Sao Paulo in Brazil (to which service frequency from Heathrow is relatively lower).

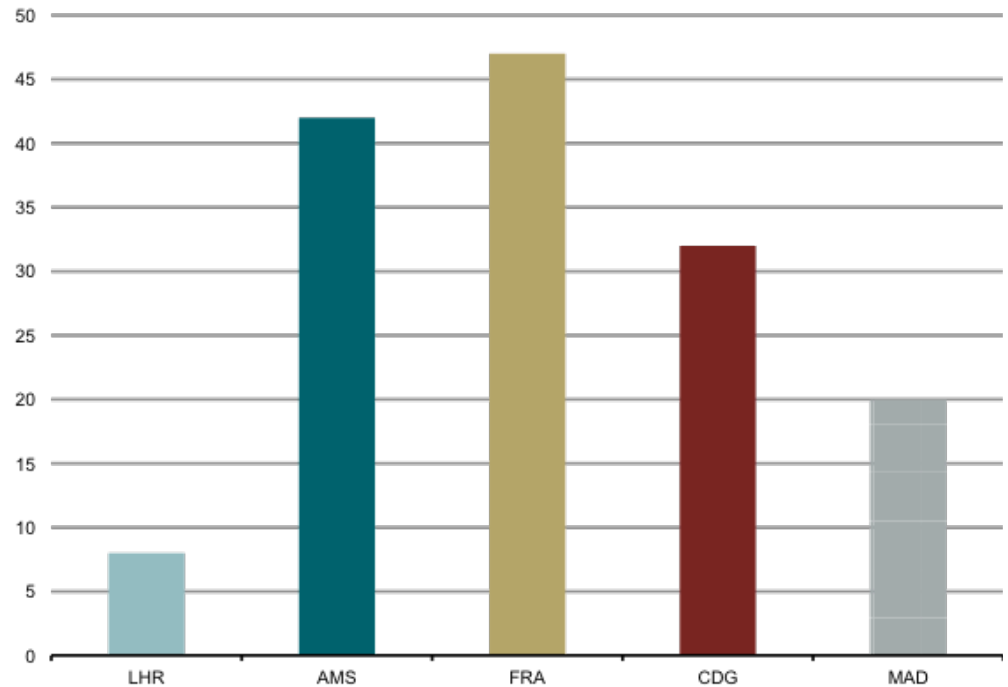
Figure 9. Heathrow serves significant shares of transfer passengers in the most established markets



Source: Frontier analysis of IATA Airport IS data

The other hubs, and particularly Frankfurt and Amsterdam, are much more reliant on transfer passengers to make the routes viable than is Heathrow, which has a bigger domestic population and business community creating demand for routes. Figure 10 below shows the number of long haul routes that carry more than 50% transfer passengers, served from each of the Western European hubs.

Figure 10. Long haul routes at Western European hubs with more than half of the passengers transferring via the hub



Source: Frontier analysis of IATA Airport IS data

This shows us two things:

- Airlines at the other European hub airports rely more on transfer passengers in terms of ensuring route viability and local connectivity than those at Heathrow do⁽¹⁵⁾.
- That Heathrow has the potential to serve even more routes than it does now, and that airlines could viably offer even better service frequencies than they do now, if there was the capacity required to enable them to do so. This would better connect London with world markets.

⁽¹⁵⁾ Nonetheless, as previously noted, Heathrow in absolute terms has a similar number of transfer passengers to other European hubs, and the profitability of a route can depend on as few as 10-15% transfer passengers.

4.3 Slipping from the premier league of international connectivity

Heathrow is doing well, but the UK is underachieving in terms of its potential level of connectivity to short haul and long haul destinations. This results in reduced opportunities to attract businesses to London, reduced opportunities to do business between London and unconnected markets, and reduced consumer choice.

What is achieved now is underpinned by the presence of transfer passengers travelling via Heathrow. These passengers are vitally important to the success, and indeed the viability, of long haul service airlines' business model. Without these passengers, there would be a huge reduction in long haul connectivity, both in terms of reduced service frequency and fewer destinations served.

That Heathrow serves transfer passengers is of fundamental importance to the UK: that they contribute to connecting the UK to world markets implies that, were it not for serving this market, London would be a much harder place to get to for many people, and therefore a less attractive place to do business. The success of Heathrow as a hub contributes to:

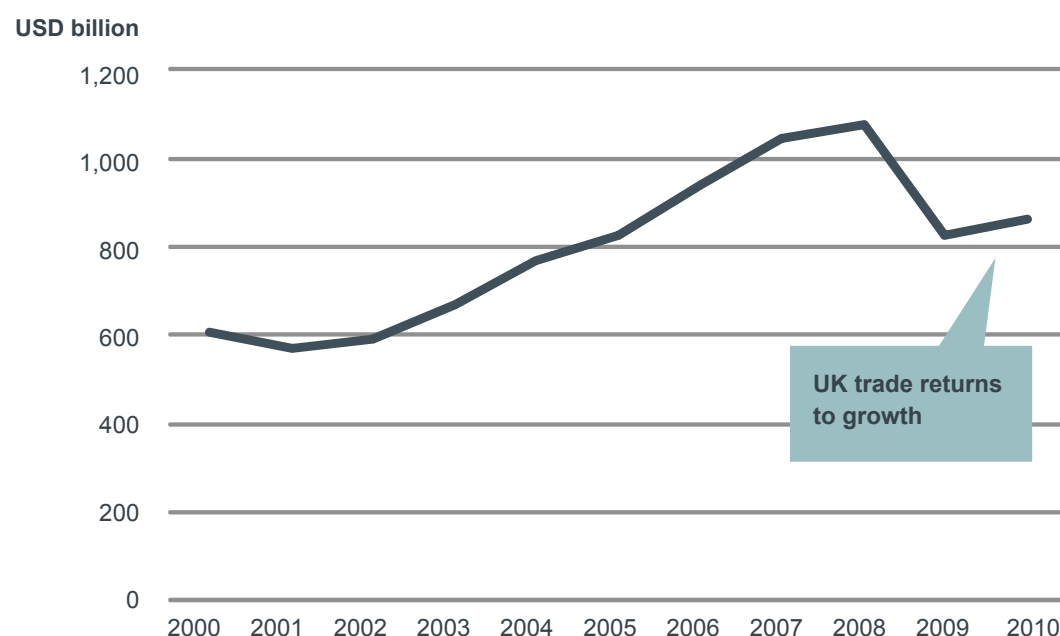
- aviation employment in the area
- bringing long haul visitors to the UK who bring more than £7 billion a year into the UK economy
- Britain's trade links to world markets, which we discuss in the next section

5 UK trade and the importance of connectivity

Britain's international connections through Heathrow play a crucial role in supporting international trade and enabling British businesses to take advantage of opportunities overseas. But how well placed is the UK to continue to seize those opportunities?

British trade surged by around 90% from 2000 until the economic downturn hit in 2008, as shown in Figure 11. There has been a return to growth in trade over the last couple of years, and by 2010 UK trade stood at around USD900 billion according to the IMF, around £590 billion at 2010 exchange rates⁽¹⁶⁾.

Figure 11. UK Trade since 2000



Source: IMF

⁽¹⁶⁾ The trade data from the IMF for all countries is recorded in US dollars. Throughout the report we have presented equivalent values in British Pounds using the Bank of England annual average spot exchange rate for 2010 of 0.6475 pounds per dollar.

5.1.1 The UK and the shifting balance of global economic power

This trade adds more than £150 billion to the UK’s total economic output⁽¹⁷⁾. Over the next ten years around half of all economic growth in the world is predicted by the IMF to be in Emerging Market countries. And most of that is expected to be in a group of just eight countries, which already account for nearly a quarter of world GDP. As the balance of economic strength and growth shifts from the developed world to the Emerging Markets, it will be increasingly important for the UK to be connected by air to these countries so that it remains attractive as a place to invest and do business.

5.1.2 Growth Economies and Emerging Markets

In this report we refer to the largest of the Emerging Market countries as the Growth Economies. Figure 12 sets out some brief details about these important trading nations, and defines the remaining Emerging Markets.

Figure 12. Growth Economies and Emerging Markets defined

Growth Economies	Other Emerging Markets
<ul style="list-style-type: none">The 8 largest Emerging Markets23% of world GDP nowPredicted to contribute a large share of future world GDP growthThe most important trading nations of the future <p>Brazil, Russia, India, China, Mexico, Korea, Turkey, Indonesia</p>	<ul style="list-style-type: none">Fast growing economies but lower contributions to total world GDP growth12% of world GDP nowIn order of the size of their economies, they are: <p>Poland, Saudi Arabia, South Africa, Argentina, Iran, Venezuela, Colombia, UAE, Malaysia, Egypt, Nigeria, Chile, Czech Republic, Philippines, Pakistan, Romania, Peru, Ukraine, Hungary, Qatar, Kuwait, Bangladesh, Vietnam</p>

Source: Goldman Sachs, January 2011

⁽¹⁷⁾ Oxford Economic Forecasting estimate.

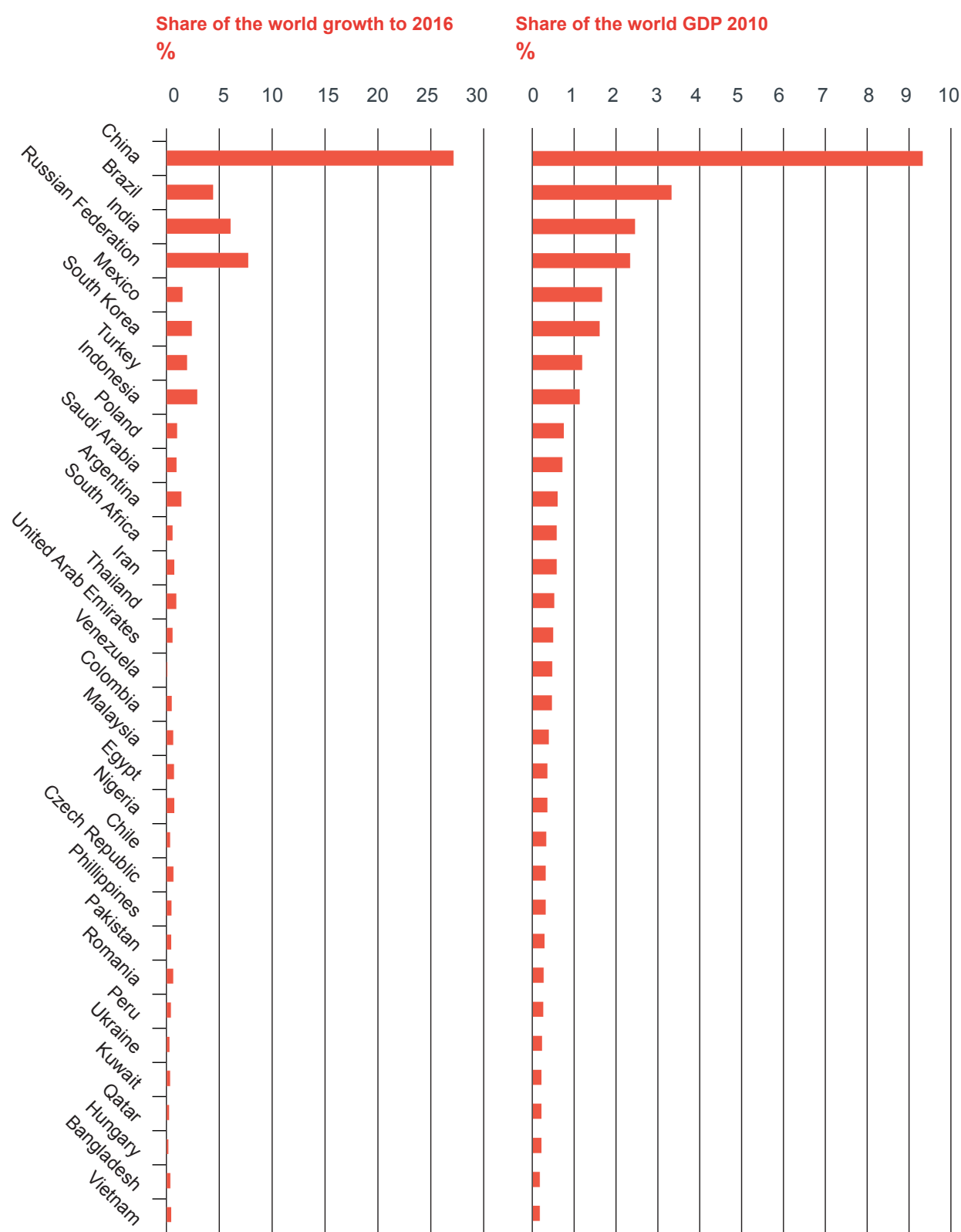
5.1.3 Recent and future growth in Emerging Markets

Emerging Market countries GDP now represent more than a third of world GDP, having grown rapidly over the last decade.

Figure 13 shows the 2010 share of world GDP generated in each of these countries, and each countries predicted share of world growth to 2016. There are no daily flights between London and ten of these countries, namely:

- Mexico
- Indonesia
- Venezuela
- Colombia
- Chile
- Philippines
- Pakistan
- Peru
- Ukraine
- Vietnam

Figure 13. Growth Economies and Emerging Market shares of world GDP and predicted growth

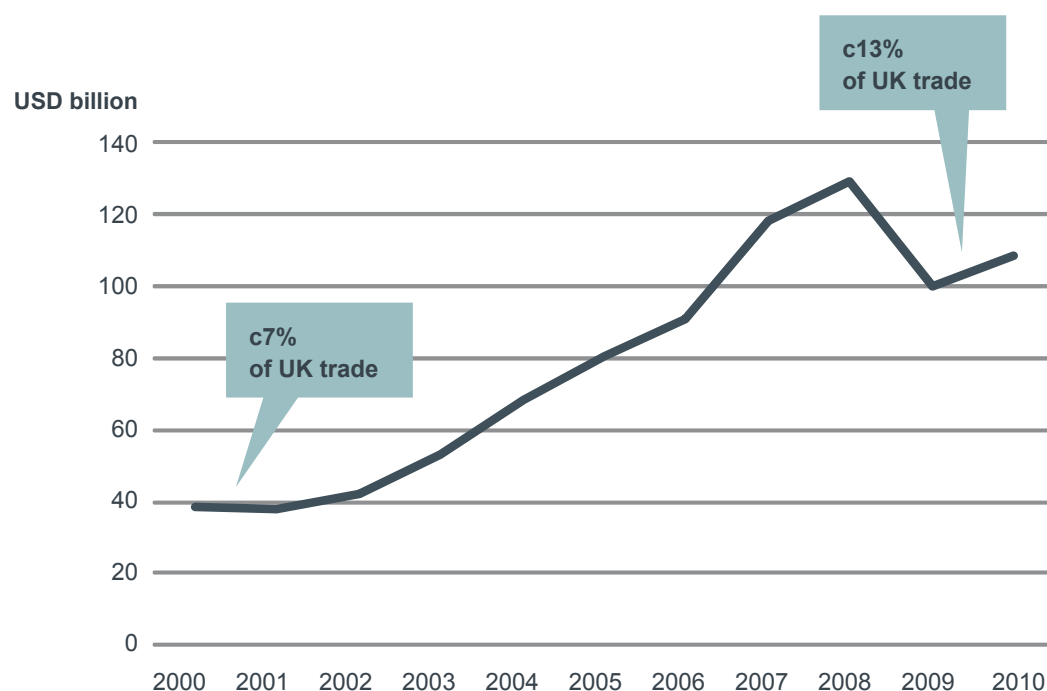


Source: IMF

5.1.4 UK trade with the Growth Economies

UK trade with the Growth Economies has nearly trebled over the last decade. As shown in Figure 14, UK trade with these eight countries has grown faster than the average, increasing from seven to 13%, over the decade to 2010. The predicted growth of these economies over the next ten years suggests that this trend will continue.

Figure 14. UK trade with Growth Economies



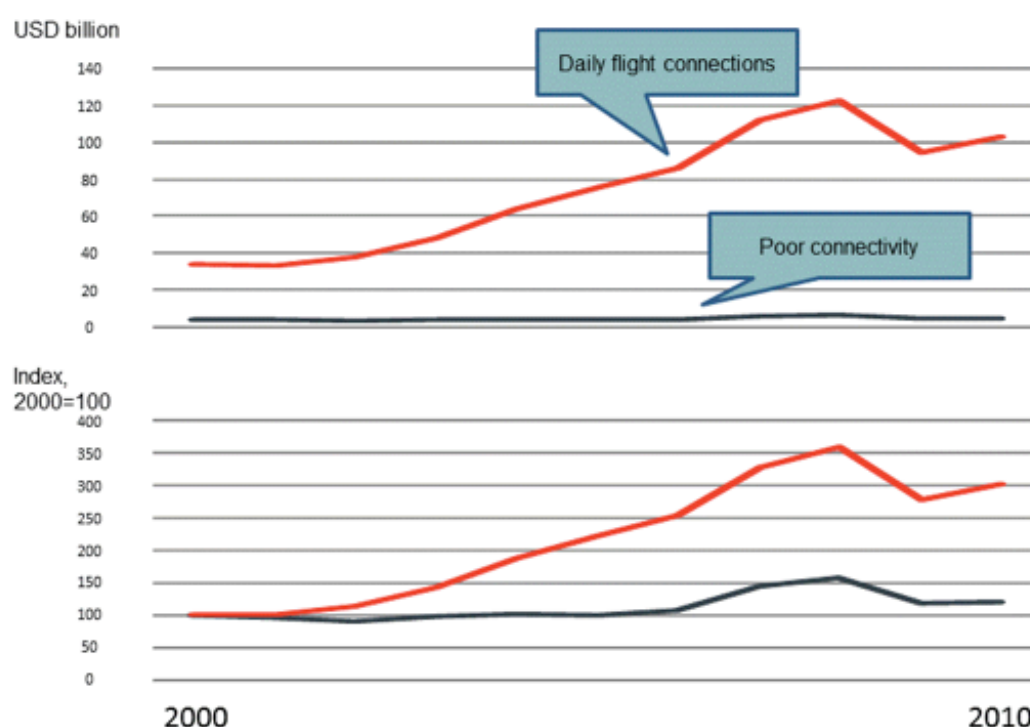
Source: Frontier analysis of IMF data

However, the levels of UK trade with these countries and the rates of growth are not as good as they might be. Some of the potential trade routes are not supported by direct connectivity with Heathrow, which would facilitate easier travel to London and increase the likelihood of businesses located in each of the countries developing relationships with UK businesses.

5.1.5 Connectivity and trade with Growth Economies

The difference between UK trade with connected and unconnected Growth Economies is stark. The UK trades about twenty times as much with Growth Market countries with daily (or better) direct flight connections as it does with countries with poor connectivity. Similarly, the rate of growth in UK trade is substantially lower where daily flight connections with Heathrow are not available. The levels of trade and the growth rates are shown in Figure 15 below.

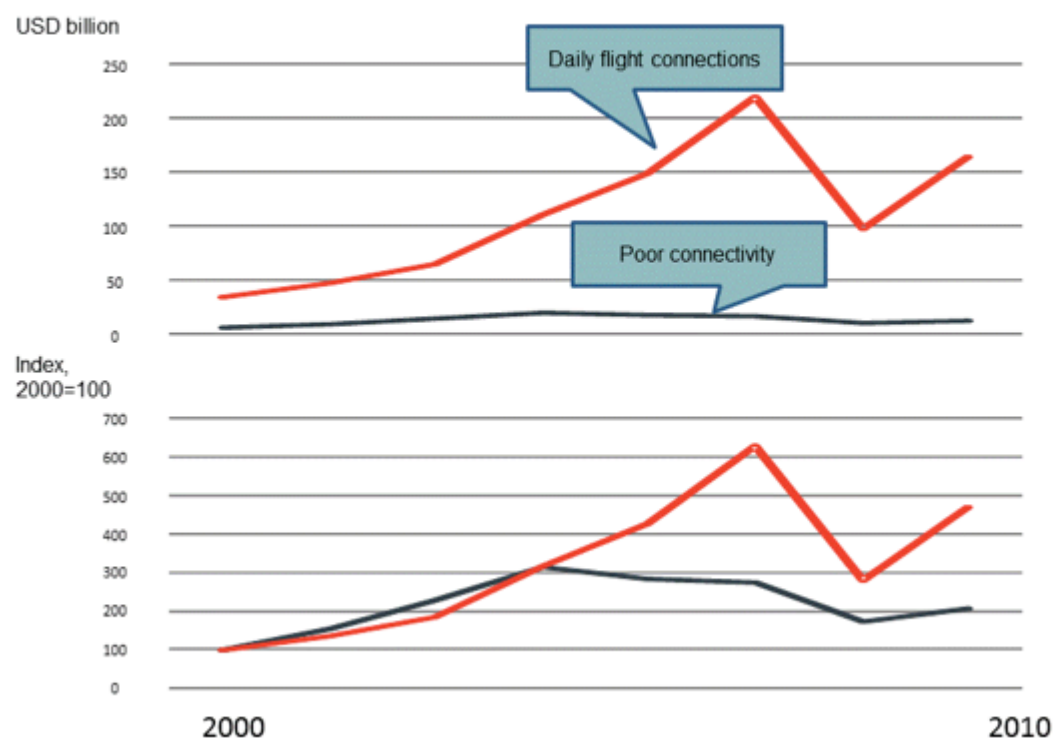
Figure 15. UK trade is greater and grows faster with Growth Economies that have daily flight connections with Heathrow



Source: Frontier analysis of IMF data

A very similar pattern is observed with capital investments made between the UK and Emerging Markets, as is shown in Figure 16 below. This suggests that firms trade more with and invest more in markets which are most convenient for staff to reach, and that where connectivity is poor, trade links and inward investment opportunities are more difficult to establish.

A similar effect is likely in terms of connectivity to major regions within the very large emerging economies in China, India and Brazil for example. Connectivity only to a national capital or one other major centre means missed opportunities in other very large economic clusters. However there is no reliable trade data at the regional level so we have taken the most conservative view looking only at national connectivity.

Figure 16. Capital investment between the UK and Emerging Markets

Source: Frontier analysis of IMF and Thompson Catpstats data

In the UK the major potential trading partners amongst these Growth Economies with which we have poor direct flight connectivity are Mexico and Indonesia. There has certainly been a great deal of economic growth in these countries, and this is predicted to accelerate over the next ten years. Other European hub airports, such as Frankfurt and Amsterdam Schiphol, do offer regular daily flights to these markets, and those countries do trade more with them than the UK does (relative to the size of their national GDPs).

5.2 A virtuous circle between trade and connectivity

The previous discussion shows the clear correlation between trade volumes and transport links.

We are well aware that establishing a clear direction of causality between connectivity and economic growth is extremely difficult. Do these countries trade because they are connected, or are they connected because they trade?

In many ways the answer is “yes” to both questions.

We do not think that connectivity creates trade – people do not do business just because there is a transport connection. So having connectivity is not enough to guarantee trade. But equally, businesses are unlikely to trade with each other when it is difficult for the management of those businesses to visit their suppliers and / or markets and get real feel for them. Also businesses looking to locate regional head offices on a different continent are also more likely to choose

somewhere easily accessible from their home territory. So connectivity is needed for trade to flourish.

We are therefore not suggesting that alleviating the constraints on growth at Heathrow would be enough to guarantee a huge expansion in trade between the UK and the economies of the Emerging Markets. That expansion would be down to the ingenuity and competitiveness of UK businesses. But without the capacity to forge the necessary links it will be much harder for this trade to flourish.

5.2.1 Which comes first, connectivity or trade?

Certainly, in taking a decision to introduce a new route, airlines consider whether demand will be great enough to justify launching and operating that route. In this respect, airlines have been willing, and still are, to take the risk of testing routes. The risk that the airlines' take is lower the larger is the route network operating at the hub airport. This is because they are able to serve passengers transferring through the hub rather than only those wanting to travel to the local catchment area.

As transfer markets are well established via Western European hubs, airlines have a clear idea about how much of an existing transfer market they could serve if they launch a new route in competition with one serving another hub.

At Heathrow, however, the opportunity to grow their businesses in this way is not available. This is because airlines can only serve new routes if they cut existing routes.

Because the routes cannot be added at Heathrow, the local market is not well connected to destinations where rapid economic growth has occurred only in recent years. And this breaks the virtuous circle, making it harder for businesses to forge relationships with these emerging trading powers.

5.2.2 Missing out on trade

In addition to Mexico and Indonesia there are a further eight emerging Market countries to which daily flights are not available from Heathrow:

- Venezuela, Colombia, Chile, Philippines, Pakistan, Peru, Ukraine, and Vietnam.

In 2009, the UK traded £200 billion with the 22 Emerging Market countries with daily services from Heathrow, and £23 billion with the other ten. If the UK's trade with these ten could reach the average level of the Emerging Markets group with daily flights (after adjusting for the size of the countries' economies) then the UK could be missing out on as much as £17 billion a year of trade with these ten countries.

In 2009, there were £105 billion of capital investments made between the UK and Emerging Markets with daily flight connections. Similarly to the UK trade position, capital investment is much less between the UK and Emerging Markets with poor connectivity: only £9 billion was invested between the UK and these ten fast growing economies. This suggests that the UK could be missing out up to £12 billion, or more than half of investment opportunities with these ten countries, applying the same adjustments as we did to assess the trade potential above.

This basic analysis suggests that the UK could be missing out on as much as £29 billion a year of trade and investment opportunities with Growth and Emerging Market countries.

However, this assumes that the trading conditions in these countries improves to be more like the Emerging Market countries that we are connected to with daily flights. So it does not account for other factors, such as political institutions, historic links and so forth that make it easier or harder to trade with these countries. These factors are not considered in the estimate above.

We have compared the UK levels of trade with those of the other European countries with the other major hub airports in this study. This allows us to better understand how UK trade might improve if the UK were more easily accessible to Emerging Markets, even if the trading conditions in the Emerging Market countries don't change over time. This allows us to estimate a lower bound for the opportunity to trade that the UK seems to be missing out on already. In our method we are taking into account the nuances of the Emerging Market countries' (such as political institutions), the size of each of the other European countries' economies, and the relative importance of trade to each of those countries.

In this analysis we find that the European countries with daily flights to these Emerging Markets:

- Trade more with Emerging Markets to which they have daily flights
- Typically trade more with each of these countries than the UK does, after adjustments for the size of the economy and the importance of trade⁽¹⁸⁾

This approach suggests that even on our most conservative estimate Britain has the potential to increase trade by a minimum of around £1.2 billion a year.

Considering the forecast economic growth of the Emerging Markets to which the UK is not connected, this gap is likely to reach £1.6 billion in 2021. Britain will miss out on trade of around £14 billion over the next ten years.

⁽¹⁸⁾ The exception is the Philippines which is connected only to Amsterdam Schiphol amongst the European hubs, and in this case the Philippines is a less important trading partner to the Netherlands than it is with the other European countries in this study.

6 The widening connectivity gap

The UK is missing out on international connections because Heathrow is not fulfilling its potential as a hub in providing connectivity. Despite the existing size of the economy Heathrow serves, there are important destinations it does not serve. And there are destinations it does serve, but where the frequency of service is less than airlines could sustainably operate. This places the UK in a less favourable position in terms of trade and investment opportunities. Moreover, economic growth in Emerging Markets means this connectivity gap will grow over time, because it will be precisely these growing markets that Heathrow will be unable to serve. Thus the gap between Heathrow's potential and what it is currently able to deliver will become more and more stark.

In this section we assess Heathrow's potential as a hub airport. First we consider the connectivity Heathrow could provide if it were not constrained⁽¹⁹⁾, by estimating the share of the European transfer passenger market that an unconstrained Heathrow would be well placed to acquire. This includes both additional routes being served and better frequency of service on existing routes. We then build a forecast of aviation demand into the future. This predicts how much the capacity constraint hinders the UK's connectivity and its trading position, both now and in the future.

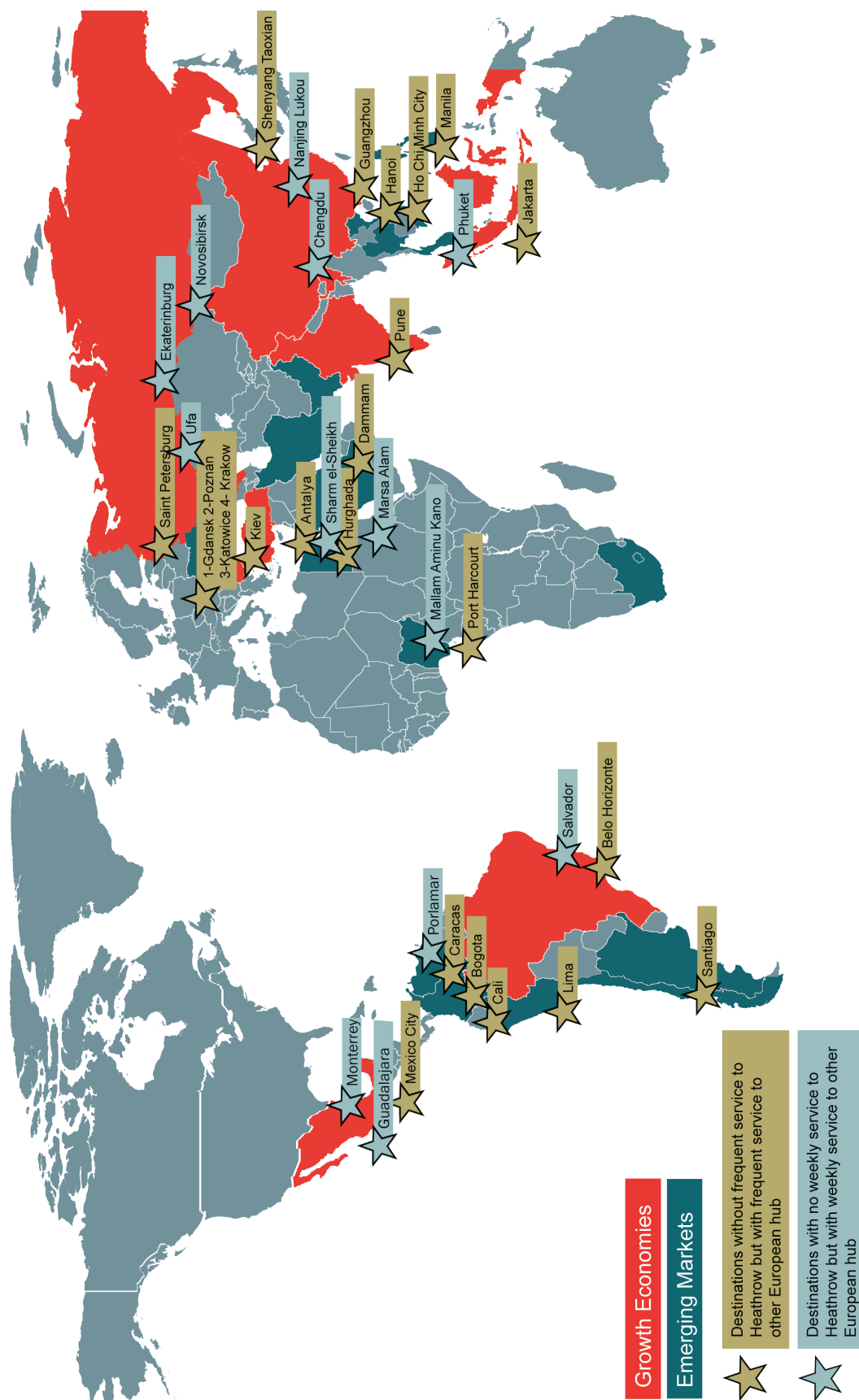
6.1 The connectivity gap with Emerging Markets

Britain is already suffering a connectivity gap with Emerging Markets. There are currently 25 airports within Emerging Markets with frequent connections to one of the European hub airports but without such a connection to Heathrow. These include important economic centres such as Mexico City, Manila and St Petersburg. The lack of connectivity to Heathrow makes it more difficult for the UK to do business with these countries, isolating the UK from the economic growth that will occur there.

In the Emerging Market countries there are also 13 airports with at least a weekly service to a European hub, but without this level of connection to Heathrow. These are nascent routes which could grow when these destinations become more important. Whilst the frequency of these services through other European hubs could easily be increased, it is unlikely that in its current state of capacity Heathrow could serve these destinations at all. The map below shows these destinations.

⁽¹⁹⁾ By "constrained", we mean the fact that Heathrow is unable to supply all the aviation slots that would be demanded of it, since it has a planning limit of 480,000 air transport movements per year.

Figure 17. The connectivity gap with Emerging Markets: routes served from other European hub airports, but not from Heathrow



Source: Frontier analysis of Thompson Capstats data

It is worth considering which of these destinations Heathrow might serve if it could fulfil its potential as a hub airport. Clearly, if the majority of passengers on a route are travelling direct between the origin and the destination, they would be less keen on an alternative route travelling indirectly through another hub, so there would be insufficient demand to sustain a route from Heathrow. However, if there are many transfer passengers flying the route, they are already going through a European hub and it is likely that Heathrow could be an attractive alternative for many of them.

We have assessed the size and structure of the transfer markets on these routes to see which routes could plausibly be sustained through Heathrow. Our methodology is straightforward: for each destination we add together the number of transfer passengers flying there from the European hubs. We then consider how many of these hubs are operating on that route and assume that if direct services were added at Heathrow it could achieve a symmetric share of the market. For example, if a destination is served from three hubs and Heathrow was added, we predict that Heathrow would typically be able to achieve a 25 % share of the European transfer market to that destination once the service is properly established. Given the number of additional transfer passengers that would fly through Heathrow, we can then calculate the frequency of connection this would imply⁽²⁰⁾.

6.2 Case study: potential to serve new routes

The Philippines is one of the Emerging Markets identified by Goldman Sachs as the main future contributors to world GDP. It represented around 2% of world GDP in 2010 and this share is forecast to increase in the future. Over the last 10 years, the Philippines GDP has grown more than 8% a year.

From the major European hubs, Manila is only served via Amsterdam. Around 107,000 passengers a year flying on this route transfer at Schiphol. If a Heathrow service were introduced on this route we predict it might take a 50% share of the transfer market, attracting 54,000 passengers a year. This would be sufficient to sustain over 300 direct flights a year to Manila, suggesting it would be viable to connect Heathrow and Manila with daily services.

Local factors might favour the existing hub and this could make our assumption of achieving a symmetric market share optimistic. On the other hand, Heathrow would become a more attractive hub, as it becomes connected to more destinations overall. We have also excluded untapped demand. That is, people who would fly direct from Heathrow, but don't fly at all now because they'd have to transfer through a hub.

⁽²⁰⁾ On long-haul routes we assume that a Boeing 767 (capacity of 230) would fly with a 75% load factor. For short-haul routes we assume that an Airbus A318 (capacity 132) would fly with a 75% load factor.

This analysis suggests that in the absence of capacity constraints Heathrow could:

- operate daily flights to six Emerging Market long haul destinations (Mexico City, Caracas, Lima, Santiago, Bogota and Manila);
- also serve 9 additional long haul emerging market destinations with lower service frequency (Guangzhou, Hanoi, Ho Chi Minh City, Cancun, Jakarta, Dammam, Chengdu, Nanjing and Cali);
- sustain services at least weekly to 30 other long haul destinations (in developed and Emerging Markets).

Heathrow currently serves around 16% of European transfer passengers⁽²¹⁾. If Heathrow were able to fulfil its potential as a hub in the way described above Heathrow could increase this share to 21% of European transfer passengers.

6.3 Case study: potential to strengthen existing routes

370,000 transfer passengers fly to Beijing via European hub airports. Only 27,000 (7%) of these fly via Heathrow. If airlines were able to increase their service frequency, we predict that Heathrow would be able to serve 25% of the transfer market, adding 66,000 transfer passengers. Since airlines currently serve 142,000 passengers flying between Heathrow and Beijing in total, this would represent a 46% increase. This suggests that at least one additional daily flight could be added, before accounting for increases in demand in London or Beijing attracted by greater service frequency or more competition.

While Heathrow currently has 27,000 transfer passengers to Beijing, Frankfurt has 157,000 and offers around 1000 flights there per annum. This is despite the fact that Heathrow actually serves a higher number of origin/destination passengers to Beijing (232,000 as opposed to 174,000 at Frankfurt). This suggests Heathrow would easily be able to improve the frequency of service to Beijing, but for the constraint on capacity.

Simply by serving a greater share of the European transfer market, new routes could be added at Heathrow, and existing service levels could be improved, thereby benefiting UK passengers and strengthening the UK's global economic links. This could imply an increase in long-haul seats flown from 26 million to 30 million.

Another way to think about Heathrow's potential is to consider what it would look like if it was not capacity constrained at all. Paris Charles de Gaulle provides a useful benchmark for this thought exercise, since Paris and London are comparable as global centres (albeit of different economic scale) and have similar geographical locations. The difference is that Heathrow is capacity constrained whereas Charles de Gaulle is not. If Heathrow could fulfil its potential it might operate on a similar scale relative to the London economy as Charles de Gaulle does relative to Paris. We have assessed this by comparing the ratio of long-haul seats flown relative to GDP of the city. Charles de Gaulle flies 81 long haul seats per million EUR of Paris GDP. Heathrow flies only 68 long haul seats per million EUR of London GDP. If Heathrow could achieve a similar seat to GDP ratio, this

⁽²¹⁾ Analysis of IATA Airport IS data.

would imply 31 million long haul seats out of Heathrow each year instead of 26 million; an uplift of 18%. This indicates that our detailed bottom-up estimate of 30 million looks to be conservative, because the achievement of equal market shares would still leave Heathrow with fewer long haul passengers per million EUR of GDP than its rival hubs.

6.4 The future connectivity gap

Here we consider how the connectivity gap might change in the future in the face of continued economic growth in Emerging Markets. Our analysis suggests that the impact of the capacity constraint will grow over time. We reach this conclusion by comparing two types of forecast – a forecast of Heathrow as it is (the ‘constrained forecast’) and a forecast of Heathrow as it would be if it were able to fulfil its potential (the ‘unconstrained forecast’).

As a general assumption, passenger numbers are expected to grow depending on the growth in GDP, tempered by the responsiveness of demand to changes in the price of air travel.

6.5 Constraints at Heathrow

- The constrained and unconstrained forecasts set out below analyse the future impacts of the limits on the number of aircraft movements which can physically be handled at Heathrow within the airports existing capacity.
- There are a number of policy options available to alleviate constraints at Heathrow. One option is the construction of a third runway, which the Government has ruled out. Other options include more efficient use of the existing runways. The Government recently gave its approval for a limited experiment with mixed mode operation to reduce flight delays. In addition, it would be possible to extend the time of airport operations.
- A further constraint on capacity at the airport is the size of aircraft. Both our constrained and unconstrained projections take account of increases in the size and seating capacity of aircraft operating at Heathrow.

6.6 Impact of price on demand

- The price of air travel depends on fuel, taxes, and changes to technical efficiency in the aviation industry. We have used a simple ‘cash and carry’ approach to forward commodity pricing.
- The responsiveness of demand to price is modelled using the ‘price elasticity of demand’, which measures the percentage change in demand resulting from a percentage change in price. Price elasticity varies by purpose of trip. Leisure travellers are more responsive to price (if aviation becomes too expensive they might opt instead for domestic travel). Business travellers are less responsive to price changes because they travel for specific reasons, often at short notice, and it is less easy to make alternative arrangements.
- We use International Passengers’ Survey data to identify the proportions of travellers in each category (leisure/business/visiting friends and relations)

flying on different types of route (short-haul/long-haul west/long-haul east). We use corresponding price elasticities⁽²²⁾ for each of these groups to calculate the average price response on each type of route.

6.7 Impact of economic growth on demand

- Aviation demand increases with income. We use GDP projections together with measures of responsiveness of demand to income.
- Aviation demand depends on changes in income at both ends of the route, not just the UK end. Therefore we use the average GDP of the countries in the route, weighted by the passengers' origin. For example, whilst the UK economy is predicted to have grown by 13% from 2011 to 2016, the Chinese economy will have grown by 57%. If half of the passengers start their trip in each country then the weighted average of these two countries is 35%.
- We use IMF World Economic Outlook GDP projections to calculate GDP growth. The IMF explicitly forecasts out to 2016. For 2021 estimates we have extrapolated the 2010 to 2016 rate of growth.
- The DfT estimates that a 1% rise in income is associated with a 1.4% rise in air travel demand (i.e. an income elasticity of 1.4). This is the change in air travel demand across all airports that DfT would expect to see as income increases. However, academic studies show that the income elasticity is lower (1.14). This lower estimate is consistent with what has been experienced at Heathrow (with its constrained capacity) over the last ten years.. As a result, economic growth produces a smaller increase in passenger numbers at Heathrow than it does at other airports⁽²³⁾.
- In terms of GDP-driven changes, passenger numbers from Heathrow to China, for example, will increase by $35\% \times 1.14 = 40\%$. If Heathrow was not constrained the growth in passenger numbers would be $35\% \times 1.4 = 49\%$.

Our forecast combines the price effect and income effect. We develop two types of forecast – the constrained forecast and the unconstrained forecast.

The constrained forecast is very straightforward. We simply take the passenger numbers on the different routes and scale up with the price effect and income effects. For Heathrow we use the smaller 1.14 income elasticity, reflecting constrained demand, giving smaller growth in passenger numbers. We focus on 2016 and 2021 snapshots.

We compare this with a forecast of how Heathrow would perform if fulfilling its potential as a hub airport. As a baseline we consider the world in which Heathrow serves additional routes and thickens existing ones (discussed above in the boxed text). This involves flying 30 million long-haul seats in 2009. We then apply the price and income changes to derive the 2016 and 2021 forecasts (using an income elasticity of 1.4 because the capacity constraints at Heathrow are removed in this scenario). To predict a range which accounts for local demand for new and

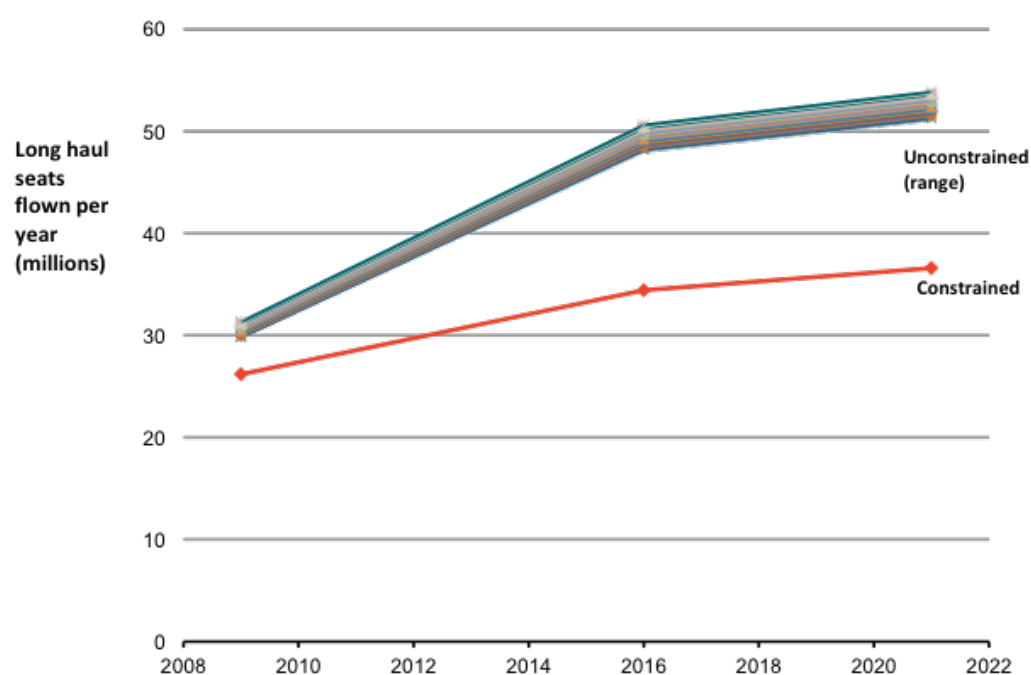
⁽²²⁾ Gillen, D.W., W.G. Morrison and C. Stewart, Air travel demand elasticities: concepts, issues and management, Department of Finance, Government of Canada, January 2003.

⁽²³⁾ Even though Heathrow is capacity constrained, passenger numbers increase as income rises as the airlines increase the size and seating density of planes, and from more efficient runway utilisation.

expanded routes we make a second forecast where the initial uplift provides for airlines at Heathrow to offer seats in proportion to those offered at Paris Charles de Gaulle (as described in Section 6.1 above).

Our constrained (i.e. with no change to airport capacity) and unconstrained forecasts are shown in Figure 18 below. The constrained forecast (red line) shows a modest increase in passenger numbers, and airline capacity into the future. The additional airline capacity in this forecast would be provided by increases in the average number of seats per flight, through introducing larger aircraft and higher capacity seating arrangements, as examples. The unconstrained forecast range begins higher and increases faster in response to passenger demand and worldwide economic growth, which can be accommodated with increased flight frequency and additional destinations, as well as increasing airline efficiency through the use of larger aircraft and so forth. The gap between constrained and unconstrained projections increases markedly.

Figure 18. Heathrow passenger forecast



Source: Frontier Economics

In the constrained forecast there is little change in the route network served by Heathrow. Meanwhile the other European hubs are expected to grow their networks, while Heathrow loses its position as Europe's number one long-haul airport⁽²⁴⁾. Instead it would become third after Frankfurt and Paris CDG, with Amsterdam close behind. This is shown in Table 7 below. In fact, Heathrow's position could be even worse than our constrained projection suggests. As the other airports improve their route networks, Heathrow would become relatively less attractive to transfer passengers, causing its share of the transfer passenger market to fall. This could lead to reductions in the frequency of service on dependent routes.

Table 7. Evolution of long haul connectivity at the 5 hubs

	Long-haul routes with daily connection				
	LHR	AMS	FRA	CDG	MAD
2009	82	64	75	77	32
2021 (constrained)	83	77	99	95	44
2021 (unconstrained)	98	75	97	93	43

Source: Frontier forecast

By contrast, in the unconstrained forecast, Heathrow would maintain its number one position:

- An additional 15 long haul routes would operate at daily frequency;
- Heathrow could serve 48 routes with weekly connectivity, allowing the network of nascent routes to grow;
- Heathrow's capacity would be significantly more geared to serving Emerging Markets than it currently is;
- Seats flown to the 8 Growth countries would reach 9 million by 2021 instead of the 3.8 million currently flown;
- By 2021, 1.6 million seats could be flown from Heathrow to China, double the capacity in the constrained forecast;
- There would also be significant expansion of service to Brazil, Mexico, Korea and Indonesia.
- These expansions would reinforce Heathrow's attractiveness as a hub, increasing its share of the transfer market.

⁽²⁴⁾ In terms of seats flown

Table 8 below shows the forecast of Heathrow's seats flown to the 8 Growth Countries, and its share of capacity within the European hubs. In the constrained forecast Heathrow's share of seats flown the European hubs to the Growth Countries would fall, from 25% now to 22% in 2021.

Table 8. Heathrow - seats flown from Heathrow to 8 Growth Countries and Heathrow's share of capacity within the 5 European hubs

	2009		2021 (constrained)		2021 (unconstrained)	
	Seats (000s)	% of Euro 5	Seats (000s)	% of Euro 5	Seats (000s)	% of Euro 5
China	380	15%	760	13%	1,570	26%
Brazil	360	19%	510	16%	1,100	31%
Russia	610	24%	880	21%	1,120	26%
India	1,750	53%	2,860	48%	3,690	55%
Mexico	60	5%	80	5%	220	12%
Korea	190	20%	280	18%	440	26%
Turkey	470	19%	640	16%	780	19%
Indonesia	0	0%	0	0%	40	8%
Total	3,830	25%	6,000	22%	9,000	31%

Source: Frontier forecast

China is predicted to continue its rapid development. Table 9 below shows the population and connectivity to the European hubs of the major Chinese population centres. Although airlines do fly directly from Heathrow to Shanghai and Beijing, the frequency is significantly less than that offered by Frankfurt or Paris CDG. Heathrow also lacks any connection to Guangzhou. The other Chinese cities are not well connected to the European hubs, but with rapid economic growth forecast there will be potential for this connectivity to develop. While the other hubs would have capacity to serve these new routes, Heathrow would not, which would thereby reduce the UK's potential for trade.

Table 9. Population and connectivity of 10 major Chinese cities

City	Population (millions) (United Nations)		Connectivity (departing flights a year) (Capstats)				
	2007	2025	LHR	AMS	FRA	CDG	MAD
Shanghai	15.0	19.4	621	589	1,110	1,323	-
Beijing	11.1	14.5	698	658	1,032	964	104
Guangzhou	8.8	11.8	-	311	211	290	-
Shenzhen	7.6	10.2	-	-	-	-	-
Wuhan	7.2	9.3	-	-	-	-	-
Tianjin	7.2	9.2	-	-	-	-	-
Hong Kong	7.2	8.3	3,539	720	778	1,145	-
Chongqing	6.5	8.3	-	-	-	-	-
Shenyang	4.8	6.2	-	-	364	-	-
Dongguan	4.5	6.2	-	-	-	-	-

Source: Frontier analysis of UN and Thompson Capstatsdata

7 Conclusion

This report has demonstrated that Heathrow is a large and successful hub airport, currently the largest in Europe, providing a high level of connectivity between the UK and the rest of the world. It provides frequent connectivity to 65 countries, serving 82 long haul routes daily, and 46 short haul three times daily.

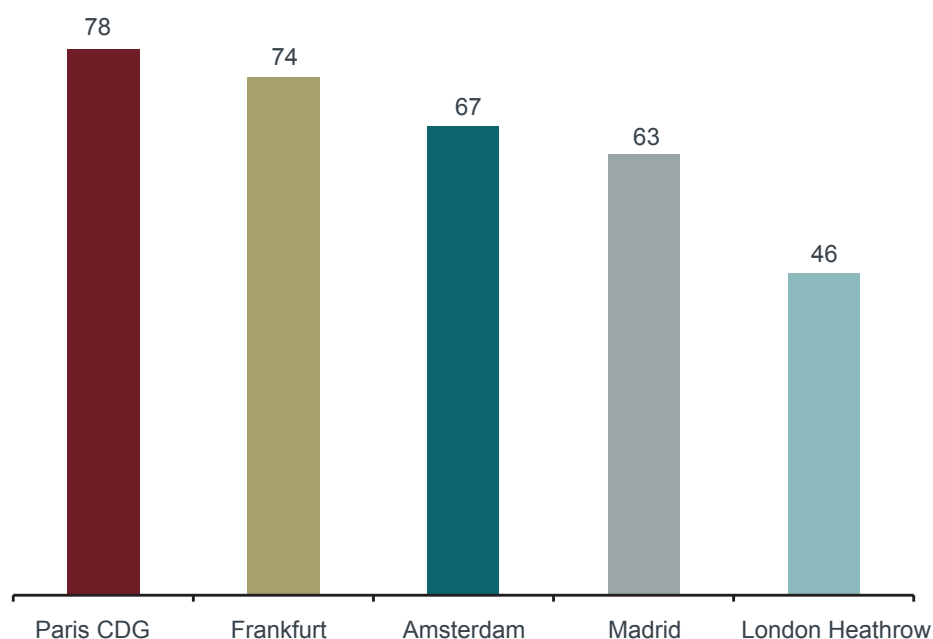
This connectivity is a vital and necessary contributor to UK's success as a trading nation.

But lack of capacity at the UK's only major hub airport means that Britain is missing out on potentially viable global economic links because Heathrow is not successful as it could be and not serving as many international routes as it could be.

While Heathrow is currently the busiest European hub airport, it risks falling behind the other European hubs. Already, the scale of the national and regional economy suggests that Heathrow could support a much more substantial route network than it currently does. The UK economy is missing out on direct economic links as a result.

At present Heathrow serves more long haul destinations than any other European hub. But because of its capacity constraints, it does this at the expense of squeezing out short haul routes. Heathrow has a much smaller short-haul network than any of its European rivals, as shown below in Figure 19.

Figure 19. Number of short haul routes served by the European hubs at least 3 times per day

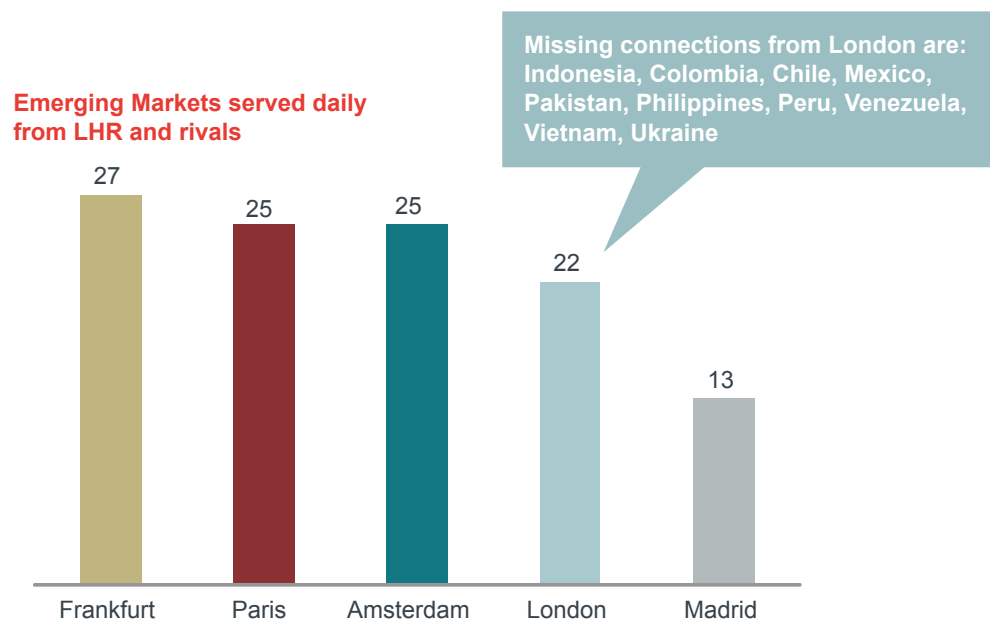


Source: Frontier analysis of Thompson Capstats data

These figures suggest that the capacity constraints at Heathrow are already having a material impact on the travel choices of passengers and on the economic connectivity of the UK.

Moreover, while Heathrow is excellent at serving established long haul markets, it does not have the capacity to forge new links with Emerging Markets, as demonstrated by the recent inability of Vietnam Airways to open a new route to Heathrow. The airport is already unable to provide the same level of connectivity as the other major European hubs to key Emerging Markets such as Indonesia, Mexico, Chile and Colombia (see Figure 20). Whereas Heathrow provides frequent connectivity to 22 Emerging and Growth Market countries, Paris CDG and Amsterdam each have frequent connections to 25 of them, whilst Frankfurt has connections to 27. Madrid Barajas currently serves fewer of these Emerging Market destinations but it is the primary hub of Iberia (under common ownership with British Airways) and serves as a key link between Europe and Latin America. The capacity has been substantially expanded in recent years, with additional runways and terminals built. This provides the opportunity for airlines to increase service levels to and transfer opportunities via Madrid in the future.

Figure 20. The number of Emerging and Growth Markets connected to each hub by a daily flight



Source: Frontier analysis of Thompson Capstats data

With Heathrow already operating at full capacity its scope to expand services is severely limited. While aviation traffic is forecast to grow at a faster rate than the overall growth in GDP, Heathrow’s ability to grow is presently limited to the rate at which average aircraft sizes can be increased, which is much more modest.

The likely consequence of this fact is that Heathrow will be unable to meet the growth in demand for those long haul routes which show the greatest growth potential over the next 10 years. Already, Heathrow is not as well connected to the Emerging Markets as some of the other European hubs are and it will have little scope to improve any further on this.

Our projections suggest that over the next 10 years, the UK's links through Heathrow to these Emerging Markets will probably expand by only 44%, while the total demand for travel between Europe and these countries will probably grow by more than 63%. Other European hubs, because they are not operating at full capacity, have the scope to fully take advantage of this growth. Over their next 10 years capacity flown between the other European hubs and the Emerging Market countries will grow by 70%. And while Heathrow's long-haul network remains unchanged, the other hubs will consolidate and expand, each adding at least a dozen high frequency routes. It is likely that within 5 years Heathrow's long-haul network will have been overtaken by Frankfurt and Paris CDG.

Nor can the UK hope that this connectivity will be easily filled at other airports. As we have discussed, the economics of aviation mean that these connections are only viable when served as part of a network at a hub airport. Routes lost to Heathrow will not be taken up by other UK airports. They will be lost to the UK altogether.

This growing connectivity gap to the Emerging Markets is not simply an operational problem for Heathrow; it is a major economic issue for the UK as a whole.

While transport connectivity is not a sufficient condition to create trade and economic growth, connectivity is an essential component of developing trade relationships. Without good connectivity trade links are unlikely to flourish and other economies, not facing the same constraints, are likely to step in and fill the gap.

We estimate that the existing constraints at Heathrow may prejudice UK trade with the Emerging Markets to the order of £1.2 billion a year. Considering the forecast economic growth of these markets, this loss could increase to the order of £1.6 billion a year by 2021.

This report demonstrates that Heathrow is a highly successful hub airport, but it could offer far more than it does at present, with the UK missing out as a result. The gap between what Heathrow is able to deliver and what it could deliver is growing, with important consequences for the UK economy.

The Government has ruled out an increase in airport capacity in London and the South East, but for the foreseeable future, Heathrow is the only airport in the UK that has the scale and capability as a global hub. Some have suggested building a new hub airport in the South East, but estimates suggest that that may take as long as 25 years to build at a cost of £40 billion. By then it may be too late.

This report demonstrates the importance of a hub in providing the connectivity to global markets upon which growth and recovery depends. Safeguarding and strengthening that connectivity means promoting and protecting the comparative advantage Britain enjoys from having a hub airport. And in the near term, Heathrow is the only airport that can perform that function.

Heathrow's position as the leading international hub airport in Europe gives the UK direct choice of access to the global markets upon which strong economic growth depends. If the UK is not to lose out and fall behind its international competitors, it needs an aviation policy and strategy that recognises this.



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