

# Connectivity and growth

## The Brexit issue

2016 edition

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# Introduction

Given the dramatic political events of the last six months, we thought it appropriate to assess their potential impact on airport asset investment and management – hence, welcome to our latest iteration of ‘Connectivity and growth – the Brexit edition’!

We continue to see a strong pipeline of airport deals around the world, and have a positive outlook for the global aviation industry, driven by both continued lower oil and interest costs. However, new threats are emerging – just as the global economy is showing signs of recovery, we now see the dark clouds of a new protectionist trade agenda in many countries. Airlines, after enjoying profit growth over the last couple of years, now need to address issues of over-capacity and increased price competition. As we continue to emerge from the economic recession beginning in 2008, these new hurdles to aviation growth challenge and test us.

With the referendum result in the UK earlier this year, our assumptions regarding the continued growth of the single European aviation market have been challenged. Low cost airlines are actively changing their operating and ownership models to protect themselves from the regulatory impacts. European demand growth is at risk – reflecting both general macroeconomic concerns of Brexit, as well as potential structural cost increases specific to aviation

operations. Questions now arise as to immigration and security arrangements and processes, ownership rules and traffic rights, and the ability for business and tourism to manage instability in the currency markets.

In this year’s compendium we open with Andrew Sentance’s observations on the potential of aviation market, and the issues that may impact growth. We have updated our analysis for the key themes of traffic, connectivity and valuations – core considerations for airport investment. We have also added two new articles, one detailing the threats and opportunities of Brexit, and another that assesses the impact of aeronautical charges on traffic growth and airport marketing.

I hope you find this year’s new and updated articles interesting and provocative, and I look forward to debating and discussing these issues with you over the coming year.

Best Regards,



Michael Burns  
Partner, PwC UK

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# *Aviation growth in uncertain times*

Dr Andrew Sentance, PwC UK

These are politically uncertain times. The UK referendum vote for 'Brexit' and the election of Donald Trump as the next US President have sent shockwaves through the political systems on both sides of the Atlantic. They have also raised a new set of economic uncertainties – particularly relating to the stability and future direction of the world trading system.

What do these developments mean for the world of aviation? Aviation has been a major beneficiary of the globalisation of the world economy which has been underway since the 1990s. The opening up of major emerging markets like China and India to the global economy, the development of the Single European Market and other regional trade blocs, and the strong growth of trade and investment worldwide, have all benefited the growth of the aviation industry over the past 25 years.

Now there is a prospect of disruption to established patterns of trade and investment, with the UK leaving the European Union and the threat of protectionism. If this threat materialises, the world of aviation and its future growth could well be affected.

It will take time for it to become clear how seriously the aviation industry should take these protectionist worries. The process of Brexit will be unlikely to be complete until the 2020s. The UK government has said that it plans to trigger the provisions of Article 50 of the Lisbon Treaty by the end of March 2017, which starts a two-year negotiation on exit from the European Union. However, France and Germany both have elections next year, so it will not be until late 2017 – after these elections – that negotiations can begin in earnest. It will be a tight timetable to achieve a satisfactory exit agreement by the end of March 2019.

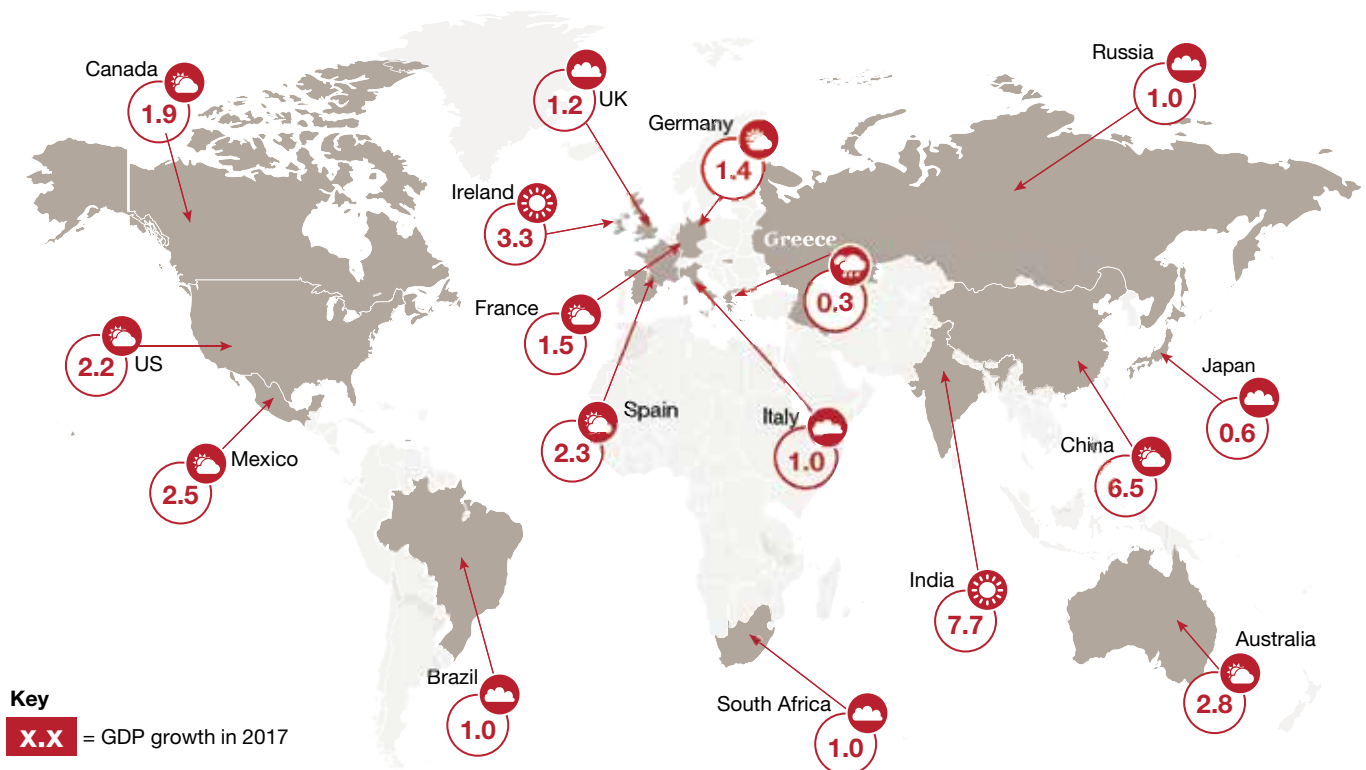
Even if an exit agreement can be achieved on this timescale, it will not be implemented immediately. There will almost certainly need to be a transitional period to put in place new administrative processes and to ratify the agreement across all 27 remaining EU countries. The process of a country leaving the European Union is totally untried and untested – it has not happened before. So no substantive changes in the formal regulation of trade and business activity between the UK and the EU will take place until the 2020s.

Across the Atlantic in the United States, it is not yet clear what policies will be pursued by the new Trump administration. Since the Presidential election, the winning candidate has appeared to row back from some of his more extreme anti-globalisation campaigning comments, which included raising the prospect that the US might leave the World Trade Organisation (WTO), repudiate the North American Free Trade Agreement (NAFTA), and impose tariffs on goods coming into the US from large emerging market economies like China and Mexico. Which Donald Trump will turn up in the White House in January – the campaigning demagogue or the business-friendly pragmatist – is still unclear.

The most immediate consequence of these political developments is therefore likely to be an air of heightened uncertainty – in which businesses hold back on investment until the global political environment becomes clearer. That is likely to act as a dampener on global growth prospects to some degree. PwC has already scaled back its forecast of UK economic growth in 2017 from just over 2% before the Brexit decision to 1.2%. (See Figure 1.)

The outlook for the US economy has also become more uncertain. A more protectionist approach in the US would be a dampener on growth worldwide, but there could be an offsetting impact from other policies. Trump has suggested he would cut taxes and boost infrastructure spending – which would provide a fiscal stimulus to the US economy. He is also in favour of reducing regulation on business, which could also help to support jobs and investment.

**Figure 1: Outlook for global economy in 2017**



Source: Oct/Nov 2016 PwC Global Economy Watch and UK Economic Outlook  
 Note: Weather icons are for indicative/descriptive purposes only

At present it would be premature to revise projections for the US economy – which is expected by PwC to grow by over 2% next year.<sup>1</sup> And we should not yet assume that some of the more extreme proposals made by the President-elect in his campaign will be realised.

In the short-term, therefore, we are likely to see a continuation of the pattern of uneven and subdued growth across the world economy that has characterised the recovery from the financial crisis since 2009 so far. After a surge in economic growth in 2010 and 2011 as the major economies bounced back from the financial crisis, global GDP growth has been relatively subdued since 2012. According to the IMF<sup>2</sup>, world economic growth has averaged 3.3% in the five years 2012-2016, slightly below the 3.5% long-term average since 1980. World growth is expected to gradually strengthen next year and in the second half of this decade – to slightly above the long-term trend.

Three main factors have contributed to this muted global growth performance. First, the major western economies are experiencing a disappointing recovery – as the tailwinds of easy money, cheap imports and strong confidence which were present before the crisis are no longer supportive of growth.

Second, the poor performance of the economies of southern Europe and France have exerted a downward drag on growth in the euro area and the European Union more generally. A substantial part of the European economy is going through a prolonged structural adjustment and economic policies have been slow to correct the underlying problems – lack of labour market flexibility, high public spending and associated tax burdens, and a less business-friendly and business-like economic climate which has been characteristic of the economies of North America and northern Europe.

The third ingredient contributing to modest global growth has been a much more variable and uneven performance in the major emerging market economies. China has slowed significantly, with growth now running at 6.5%<sup>3</sup> compared with the double digit rates recorded before 2012. Brazil and Russia have been in recession this year and are forecast to recover only slowly. Other commodity-producing economies in Africa and Latin America have been affected by the weakness of energy and commodity prices. The best performer of the major emerging market economies in recent years has been India, which is now growing at 7.5 – 8%.<sup>4</sup> However, further reforms to the Indian economy will be needed from the Modi government if the momentum of growth is to be sustained.



1, 3 & 4 See Figure 1

2 The IMF 3.3% figure comes from the October 2016 IMF World Economic Outlook



## The aviation industry worldwide has been remarkably resilient in the aftermath of the global financial crisis.

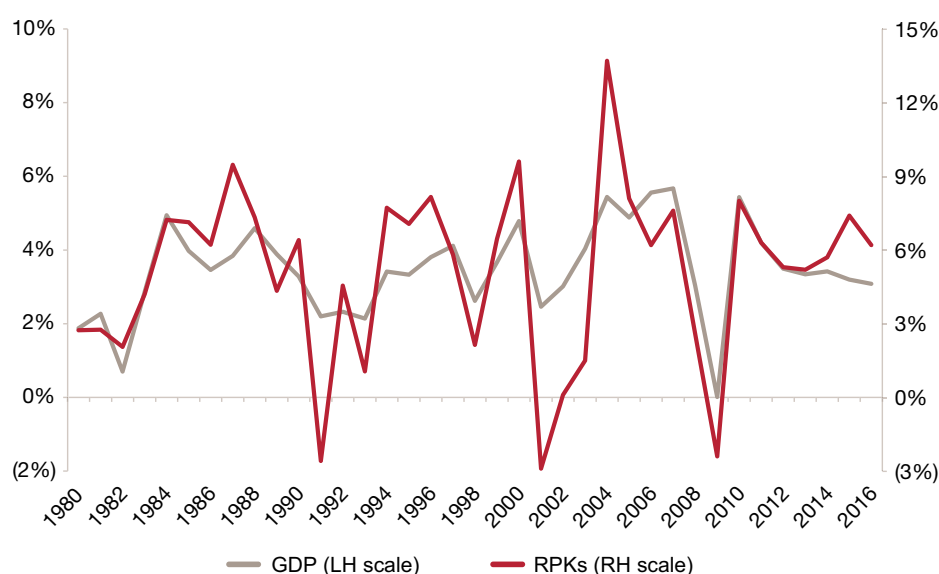
Against this background, air traffic has performed reasonably well – with passenger kilometres up 7% and air cargo rising by 6% on a year ago – according to the latest International Air Transport Association (IATA) figures. (See Figure 2.) These healthy growth figures help to put worries about political uncertainty and a new wave of protectionism into context. But continued growth of air travel requires a world which is open for business and where people can travel relatively freely across international borders. A world dominated by trade barriers, restrictions on migration and a reversal of the pattern of globalisation which has been a dominant influence for the past quarter of the century would be a different prospect.

How should airlines and airports respond to these developments in their business planning and investment? The most immediate consequence of the recent change in the political climate is a rise in risk and uncertainty. That points to the need to consider a wider range of scenarios for growth in the current environment. A continuation of recent healthy growth of air traffic demand should be considered the best case scenario, rather than a central view. The central forecast should be a more cautious assessment than in last year's planning round. And it makes sense to consider how robust plans and forecasts can be in the event of a more serious disruption to world trade and investment and a less positive outcome from both Brexit and a Trump presidency in the US.

The fundamentals of planning for sustainable growth remain the same, however. For airlines, the watchwords should be profitable growth, cost control and connectivity. Growth opportunities need to be profitable. Chasing volume growth supported by declining yields has brought financial ruin and disaster to many airlines and their investors. So airlines need to undertake a careful evaluation of growth opportunities, both in terms of new routes and additional frequency of service. They should not be seduced by the optimistic forecasts presented to them by aircraft manufacturers, which rarely mention the profitability of growth opportunities. To achieve profitable growth, airlines need to control costs and develop their networks by improving connectivity. Connectivity is at the heart of what makes airlines successful – finding new routes, either directly or via an efficient hub-and-spoke network operation.

**Figure 2: Global growth is a key driver of air travel**

Air traffic (RPKs) and World GDP – % per annum change



Airports face a different set of growth issues. Unlike airlines, which can expand capacity quite quickly by ordering a few more planes and finding new runway slots to operate, airport capacity expansion is more lumpy, requiring longer lead times, as well as much more intensive stakeholder discussion and dialogue. This is most noticeable in the major Western economies. In the UK, we have had 15 years of discussion about new runway options at the major London airports, and still no firm decision has been made – let alone any concrete or tarmac laid. The UK may be an extreme example, but similar issues exist in many other advanced economies where there is great sensitivity about the local and environmental impacts of aviation expansion.

Source: PwC analysis, based on IMF data for GDP and IATA/ICAO data for air traffic

In developing and emerging markets, airport expansion appears easier – and is often supported strongly by the regulating authorities as a means of providing strategic support to economic growth in a region or nation. But that carries a different risk – of over-ambitious expansion – akin to the problems that the airline industry has experienced by over-investing in capacity in the past. Also, alongside airports, airspace capacity needs to be developed. In Europe and North America, there is a high degree of capability in airspace management which can be deployed in Asia, the Middle East and Africa as these regions start to experience airspace congestion around major cities and airport hubs.

The final issue bearing on the aviation growth agenda – which affects aircraft/engine manufacturers, airlines, airports and airspace managers alike – is the environmental challenges facing the expansion of the industry. These environmental challenges arise both at the local level – where the main issues are noise, air quality and surface access – and globally, where the main challenge is the impact of the industry on climate change. It is encouraging that the global aviation industry has recently agreed to an approach to limiting its contribution to climate change – though much of the detail remains to be worked out. On the other hand, this is another area where a change of direction following the US presidential election could create disruption and additional uncertainty.

The aviation industry worldwide has been remarkably resilient in the aftermath of the global financial crisis. The industry has coped much better than after 9/11, which created more financial distress and business failures. But there is now growing political uncertainty following the UK's referendum decision to leave the EU and the US presidential election. A more protectionist world in which globalisation is in reverse is not a good climate for the aviation industry – and the associated risks need to be taken into account in planning and investment decisions.

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# *The impacts of Brexit on aviation*

Gwyneth MacLeod, PwC UK

The decision to leave the European Union has profound implications for the UK and the wider European aviation sector, with impacts that reach far beyond the direct sector to the broader economy. Air transport is a key enabler of economic growth, business activity and employment; as such, any significant shock or imposed constraint on airlines' access to markets will have impacts throughout and beyond the airlines, airports and manufacturers that make up the direct sector.

It has been some four months since UK citizens voted to leave the EU. Time enough to begin to have some clarity about what the impacts of this decision on aviation are likely to be? Well, no. Four months on, the only thing we know is that the government aims at the end of March 2017 to trigger Article 50 to start the process for Brexit. Arguments still abound as to whether or not the government alone has the power to do this. And while the High Court ruled on 3 November 2016 that the government did not have such power, it is possible that the ruling will be appealed.

For now, all that can be said with any certainty is that the citizens of the UK have voted to leave the EU. Information on what sort of relationship may later be sought – or achieved – is far less clear.

## *The impact of uncertainty*

Ahead of the referendum on 23 June 2016, PwC undertook significant economic research for CBI on the likely impacts on the UK's economy if it were to exit the EU<sup>1</sup>. For this, we defined and assessed several broad scenarios, which ranged from relatively 'soft' to 'hard' Brexit, as is currently being mooted in the press.

In that analysis, we estimated that the UK economy will be between 3% and 5.5% smaller by 2020 than it would have been had the UK chosen to remain in the EU, and between 1% and 3.5% by 2030, driven by a prolonged period of uncertainty as well as negative trade and migration impacts. By extension, we also expected the slower growth in GDP to dampen air passenger demand, with an estimated loss of 11.9–19.5 million passengers by 2020 (see 'Economic growth and air traffic: A look ahead' on page 13).

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<sup>1</sup> The full PwC/CBI (2016) report, 'Leaving the EU: Implications for the UK economy', can be found at <http://pwc.to/1WxjlXc>.



Whilst these predictions cannot be taken as absolute, another point that should be taken from the analysis is that the greatest impact on the economy – whatever the longer-term UK-EU relationship – **arises from uncertainty**. Uncertainty is not confined to the UK; it also affects the wider EU economy. In this environment, wider trade, investment and economic activities will likely slow whilst consumers, investors and businesses wait for greater certainty about the future economic and trading conditions. For the UK and EU economies generally, and the aviation sector itself, the effects of uncertainty are already starting to be felt (e.g. in forward bookings, currency impacts and share prices).

One thing is certain: the aviation sector is going to have to operate within the wider uncertain environment and will be impacted by its effects. But the impacts on this sector are not confined to the effects of uncertainty and the wider economic environment. The aviation sector will also be heavily dependent on the outcomes of EU-UK negotiations – on trade in air services specifically, and in related areas such as the UK's position within (or outside of) the customs union. We explore some of these briefly below.

### ***Economic growth impacts***

Historically, air passenger growth is closely related to GDP growth (again, see 'Economic growth and air traffic: A look ahead'); hence, a lower UK GDP, as we had estimated above is likely to reflect some reduction in the growth (if not absolute number) of air passengers to and from the UK. Moreover, the UK is

a net exporter of aviation – with large proportions of outbound passengers heading to European destinations. This suggests that, along with any reductions in European GDP, air passenger growth is likely to slow over the next decade.

### ***Falling currency values***

The falling value of sterling, particularly against the dollar and Euro, is another concern. Substantial currency shift was an immediate impact of the Brexit vote – with some commentators suggesting possible continuing slide toward parity with the dollar. This is where the UK's status as a net exporter of aviation is unhelpful: whereas cheaper sterling prices may encourage tourism to the UK, the numbers of inbound passengers are far outweighed by outbound (i.e. British residents travelling to destinations outside the UK). For UK outbound passengers, holidays abroad are now more expensive, which is sure to affect demand.



The picture does not improve when we consider the impact on airlines. Airline costs such as fuel, airframes and leasing charges are largely accounted in dollars. For UK-based airlines especially, which attract a high number of UK-based passengers (with income in sterling), the near-term prospects look challenging. At the time of writing, easyJet had announced a pre-tax fall of 27.9% in profits in the year to 30 September, in part due to 'higher holiday costs for UK travellers following the EU referendum and subsequent weakening of Sterling'<sup>2</sup>. Others with significant UK operations, including Ryanair and IAG, had given profit warnings, signalling that early impacts are being felt. Naturally enough, airlines are starting to respond to this environment by shifting more of their resources, where possible, to markets outside the UK.

Airlines are likely to face higher financing costs also: they have in general found it harder to secure low-cost bank lending since the financial crisis of 2008 and, consequently, have sought to raise funds via alternative mechanisms. We expect that funding may be costlier at the margin if exit results in higher operating costs and lower returns for UK airlines.

### **Labour costs**

If the free movement of labour is constrained between the UK and the EU, operating costs for UK-based airlines would likely rise.

### **Market access risks**

The major long-term risk to the aviation sector – in both the UK and the rest of the EU – lies in future market access arrangements. It is easy to forget, given the creation of the single EU market in the 1990s, that international aviation is a highly regulated industry. Pan-European carriers such as Ryanair and Wizz simply did not exist in their current form back when access to aviation markets was traded bilaterally between EU states. Their rapid expansion across Europe was made possible by the so-called 'third package' of legislation in 1997, which removed all final commercial restrictions for EU airlines flying within the EU, such as restrictions on the routes, the number of flights or the setting of fares, as well as enabling 'establishment' in any member state. The result has been the transformation of the aviation market, with rapid growth, new routes and lower fares spurred on by competition amongst airlines throughout Europe.

These freedoms are now at risk.

Trade in international air services is not subject to WTO coverage, nor is it an inclusion in wider Free Trade Agreements. Rather, trade in air services occurs on a bilateral basis between States under an International Civil Aviation Organisation (ICAO) framework – and rarely, if ever, provides for anything like the level of

freedom or operational flexibility currently enjoyed by airlines across the EU. In theory, at least, without a deal being done on future market access, the future of aviation between the UK and the EU may need to fall back on the bilateral arrangements that were in place before the creation of the single market. It is difficult to imagine reversion to the sort of regulatory environment where carriers like Ryanair could not operate domestic flights within the UK, and could not operate to and from the UK except from its state of registration (in this example, Ireland), with reciprocal restrictions placed on UK-based airlines.

There are, of course, alternative ways forward if the political will is there. The most obvious solutions are the European Common Aviation Area (ECAA), an agreement between the EU and states of the Western Balkans, Norway and Iceland; or a comprehensive EU-UK aviation agreement along the lines of the Open Aviation Area the EU had tried to negotiate with the US in 2006<sup>3</sup>. There are obvious practical and political issues to overcome in both cases. But assuming that this can be achieved, either option would potentially return most of the rights and flexibility of the current Single Market for Aviation.

<sup>2</sup> Source: easyJet website, <http://corporate.easyjet.com/~//media/Files/E/Easyjet-Plc-V2/pdf/investors/results-centre/2016/2016-full-year-results.pdf>



## The major long-term risk to the aviation sector – in both the UK and the rest of the EU – lies in future market access arrangements

There is also an issue of recognition by other countries. Neighbouring countries outside the EU, for example, are unlikely to allow UK-based airlines to operate services between their countries and EU points (e.g. Italy-Morocco) as that would constitute use of traffic rights, known as 7th freedom, that neither the EU nor the UK has agreed to exchange. This loss of operational flexibility would force airlines to base more of their fleet and operations outside the UK, where possible. The overall effect then is likely to be a shift of operational focus – with a smaller number of aircrafts based in the UK, and larger proportions of air services between UK and the rest of the EU undertaken by aircrafts that are based elsewhere. This would have flow-on impacts to the overall number of services operated to and from UK airports and throughout the aviation value chain as fewer ancillary services such as Maintenance and Repair Organisation (MRO) will be required.

### **Other regulatory risks**

**Airline ownership and control:** In order to be treated as an EU carrier, EU regulation requires that an airline be more than 50% owned and controlled by EU nationals.<sup>4</sup> If the carrier meets these criteria, it is free to operate anywhere within the EU and the wider ECAA, including domestic services within the borders of individual states. Post-Brexit, this will present a major challenge to several carriers, especially those registered in the UK.

If they can solve the shareholder issues, then a clear option is to relocate head office and registry from the UK to another EU member state. This is not a symbolic undertaking but rather would require the airline to have its 'principal place of business' in that Member State, which is defined as 'the head office or registered office within which the principal financial functions and operational control, including continued airworthiness management ... are exercised'. This would certainly imply far fewer aircraft remaining based at UK airports and on the UK airworthiness register.

<sup>3</sup> Note: The EU was unsuccessful in achieving the OAA concept in its negotiations with the US, and the resultant first stage agreement was considerably closer to a US-style open skies agreement, which confers significantly fewer rights.

<sup>4</sup> See Regulation (EC) No 1008/2008, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:293:0003:0020:en:PDF>

**Other aviation relationships:**

Currently, access for UK airlines to the US, Canada, Brazil, ECAA countries, and several countries neighbouring the EU (including Morocco, Georgia, Jordan and Israel) is provided by air services agreements between those countries and the EU. Even if the UK were to remain in the ECAA, it is not certain that coverage by these agreements could be retained, and the UK will likely have to negotiate any access gaps that would arise.

In particular with the US, this has urgent importance: not only is the US the second-largest air transport market for the UK after the EU, but anti-trust immunity for the profit-sharing alliances of both British Airways and Virgin Atlantic with their US counterparts was effectively pre-conditioned by an open skies arrangement. Airline ownership issues may again arise in these external relationships, creating headaches not just for the pan-Europeans such as Wizz and Ryanair, but also for IAG.

**Safety regulation:** The Civil Aviation Authority (CAA) is the UK's safety regulatory body, but regulation is harmonised through European Aviation Safety Agency (EASA) encompassing safety, airworthiness and certification procedures across the internal market. Based in Cologne, EASA has gradually extended its areas of competency and recruited a large staff, many transferred from national bodies. Were the UK to withdraw from EASA, it would need to re-create the certification infrastructure needed by industry, and it seems unlikely that it could do so without adding substantially to costs (which are borne by industry). And if it does not withdraw, then the UK must continue to contribute to the EASA budget – but would lose much of its influence on future rules and standards.

**Air Traffic Control:** The creation of the Single European Sky, and in particular the Single European Sky ATM Research (SESAR) technical initiative, are key to an efficient future European airspace. Whether and how the UK will be able to continue to participate in SESAR is unclear. The UK has been a leading proponent of improving airspace efficiency across the EU, and if a diminished future involvement leads to slowing of progress, then expected cost and efficiency improvements may not materialise, resulting in ongoing higher costs for airlines and, hence, consumers.

**Conclusions: How will this impact airports and their investors?**

Airport income and asset valuations are closely tied to passenger throughput. It stands to reason then that anything that affects passenger demand – and the ability of airlines to service that demand efficiently – is going to have flow-on effects to the airports, including those in the UK and the EU. Any downturn in traffic in the short to medium term will have flow-on effects to revenue, capex planning, valuations and financing. As described above, it seems likely that airlines – especially those operating a large number of services around the EU and to and from neighbouring countries – will choose to base fewer of their aircraft in the UK, which may lead to fewer rotations to and from UK airports and fewer ancillary services based there. Both of these scenarios would have direct impacts on UK airport revenue.

There are also likely to be direct costs. A consequence of any attempt to restrict free movement of people (which seems a likely outcome on both sides) means that ports and airports may need to redesign immigration and customs facilities, and that could be expensive. This is not just a one-off cost, but may result in lower throughput in terminals, or less space available for retail activities – if that space has to be dedicated to increased processing of passengers and cargo instead.

On the other hand, if post-Brexit UK is outside of the customs union, this raises the possibility of the reintroduction of duty free for international short-haul flights, which may offer a degree of offset to other impacts. Airports may, therefore, need to concentrate more of their efforts on ways to build up non-aeronautical revenue sources as a balance to the likely reduction in passenger throughput that Brexit seems set to bring.

*About the author: Gwyneth MacLeod, formerly an air services trade negotiator, is an aeropolitical and aviation policy and regulatory expert at PwC UK, based in London (gwyneth.macleod@pwc.com, +44 (0)20 7213 4402).*

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# Economic growth and air traffic: A look ahead

Edmond Lee, Vasundhara Jain, and Duncan McKellar, PwC UK

Global air traffic has grown a substantial 75%<sup>1</sup> in the past decade. Innovations in the aviation market, such as deeper aviation market liberalisation in developed economies and the rising prominence of low-cost carriers in intra-regional routes have helped spur this growth. However, propensity to fly has also been associated with global economic growth, both in emerging and developed markets. There is little consensus on the question of causality in the relationship between passenger numbers and GDP. Some think GDP drives air passenger demand; others think that better air travel infrastructure leads to GDP growth; whilst still others suggest there is a two-way causality. Mukkala and Tervo (2013)<sup>2</sup>, Ishutkina and Hansman (2009)<sup>3</sup>, and Green (2007)<sup>4</sup> all reach different conclusions on the issue.

In this article, we will look into the relationship between air traffic demand and GDP in two countries: Britain and Australia, employing our econometric and forecasting techniques as well as industry expertise. We first explain the methodology we have used, and what it reveals with regards to the GDP-passenger demand relationship in the UK and Australia.

Then we look into how volatility in passenger numbers vary from airport to airport, and potential reasons behind it. Finally, we apply our model to assess the expected impact on passenger demand as a result of revised economic outlook that follows the outcome of the UK's referendum on EU membership. Our key findings are:

- **On the country level**, in both Britain and Australia, the relationship remains strong and significant. But while we observed that the 2008 Financial Crisis is correlated to a downward level shift in air passenger demand in the UK, we did not find a similar association in Australia.
- **On the airport level**, we found that passenger numbers at London Heathrow are least responsive to GDP among the UK's four busiest airports. It is followed by London Gatwick and Manchester. London Stansted has the most volatile passenger level: demand there is around four times as responsive to UK's GDP as that of Heathrow. Passenger numbers at Sydney and Melbourne, meanwhile, is similarly responsive to Australian GDP. (See Figure 4.)

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<sup>1</sup> Sourced from the World Bank's World Development Index database.

<sup>2</sup> Mukkala, K and Tervo, H. (2013), 'Air transportation and regional growth: which way does the causality run?' *Environment and Planning A*, 45:1508-1520.

<sup>3</sup> Ishutkina, Marya and Hansman, R. John (2009), 'Analysis of the interaction between air transportation and economic activity: a worldwide perspective', MIT International Center for Air Transportation Report No. ICAT-2009-2.

<sup>4</sup> Green, R. (2007), 'Airports and economic development', *Real Estate Economics*, 35:91-112.



- **Brexit:** We estimate air passenger demand at UK airports would be 11.9 – 19.5 million lower in 2020 as a consequence of revised economic outlook, compared with a counterfactual scenario under which there had been a Remain outcome in the referendum. This forecast is built upon our impact assessment work with the Confederation of British Industry (CBI).<sup>5</sup>

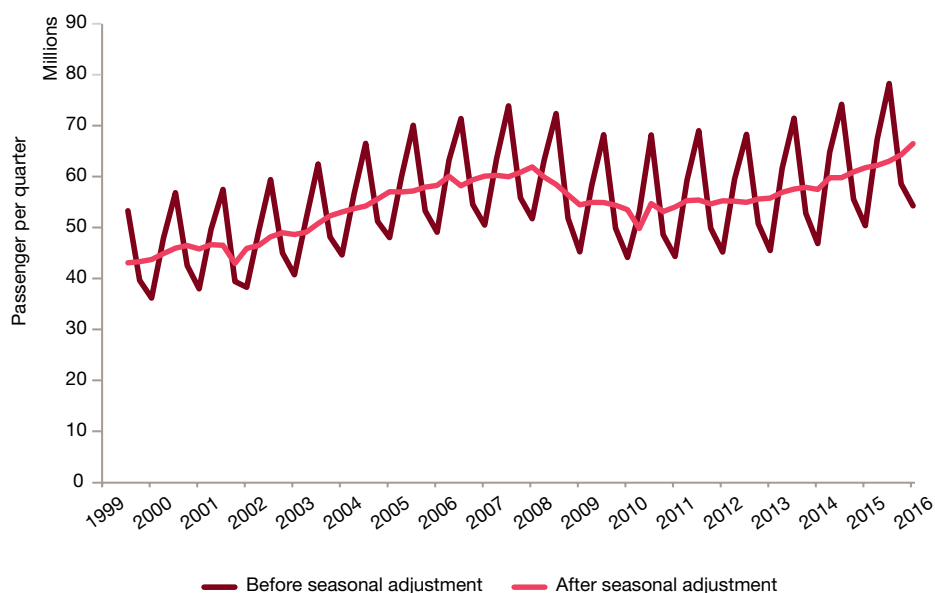
### **The GDP-air passenger demand relationship: A tale of two aviation markets**

We start our analysis with a case study of the link between national income and air travel in the UK and Australia. We obtained passenger number data from the Civil Aviation Authority (CAA) of the UK and Bureau of Infrastructure, Transport, and Regional Economics (BITRE) of Australia, and official GDP figures from the Office of National Statistics (ONS of the UK) and the Reserve Bank of Australia (RBA) respectively.

Both GDP and air passenger traffic are known to be seasonal; for example, air traffic is significantly busier in the summer months due to increased demand from leisure travellers, whilst construction GDP typically dips in winter months. In order to focus on the long-term relationship between GDP and air passenger traffic, we first remove seasonal effects from the air passenger series with the X-12-ARIMA package developed by the US Census Bureau. In Figure 1, we present the time series of air traffic in UK airports before and after seasonal adjustment.

We then examine the relationship between demand for air passengers and GDP by applying an Error Correction Model (ECM) to the adjusted time series. The ECM approach allows us to disentangle two distinct relationships from the data:

**Figure 1: UK air passenger traffic before and after seasonal adjustment, 1999 Q3 – 2016 Q1**



Source: CAA, PwC analysis

on one hand, it estimates the **long-run relationship** between GDP and air traffic; on the other hand, it describes the **short-term dynamics** such as deviations from the long-term trend, and estimates how quickly these deviations would be ‘corrected’ or revert to the mean. The ECM forms the basis of many aviation forecasting model, such as the National Air Passenger Demand Model that has been maintained by the UK Department for Transport (DfT).

Our ECM model shows a continuing relationship between GDP and passenger demand in both the UK and Australia. In the UK, we also found a significant one-off downward level shift in the wake of the 2008 global financial crisis. Figure 2 shows the central case of the forecasts we would have obtained if we had applied the same methodology at the beginning of a certain year. For example, to obtain the 2007 ‘in sample’ forecast, we applied our methodology on data up to

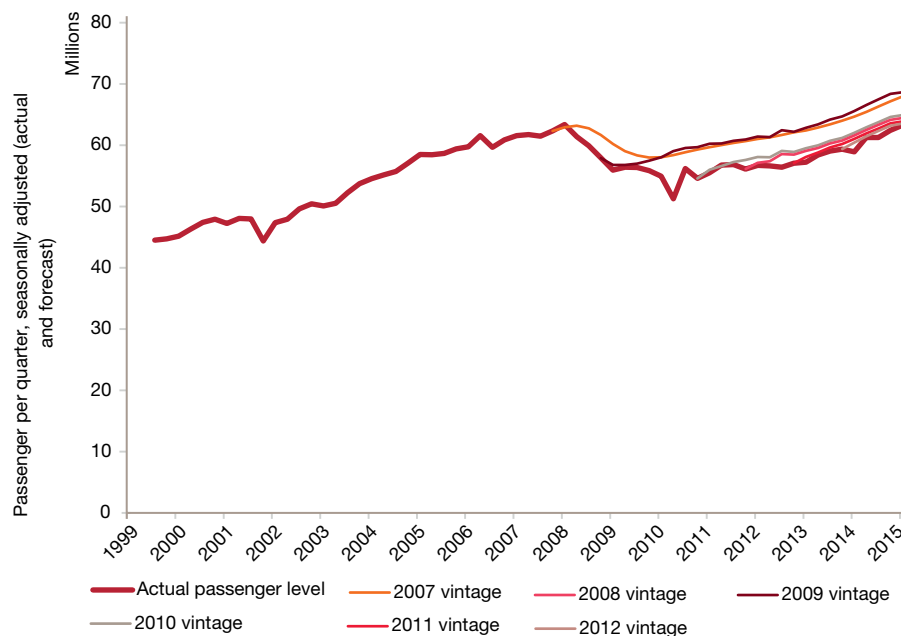
the end of 2006 and, using the resulting parameters, made projections for passenger levels based on the level of GDP that actually materialised.

We found that over the last five years, the actual passenger level through UK airports has been consistently below the forecasts by around 4-5 million people per quarter based on coefficients estimated with data up to 2008. In contrast, actual passenger levels broadly followed forecasts made using coefficients estimated with data up until 2010, 2011 and 2012. This suggests that, between 2008 and 2010, the relationship between GDP growth and demand for air passenger traffic changed.

<sup>5</sup> In the report we jointly published with the CBI in Mar 2016, we set out our view on how a decision for the UK to leave the EU would have affected the UK economy under two scenarios. We derive our passenger demand forecast based on these forecasts and the long term relationship we estimated.



**Figure 2: Backtesting the model: do past relationships predict current passenger numbers in the UK?**



Source: CAA, PwC analysis

Note: The thick burgundy line represents the actual quarterly passenger level, seasonally adjusted. The thinner lines represent the central scenario of different forecasts we would have obtained if we had carried out the analysis at the beginning of each year between 2007, 2008 and every year between 2010 and 2014.

There are various reasons why this structural break may have occurred. For example, it is plausible that the post-2008 economic recovery has been driven by growth around London, where air capacity is more constrained; it is also possible that the growth between 2002 and 2008 has largely been driven by the growth of low-cost airlines, whose business model has become more mature in the last five years. This is an area where further investigation may fruitfully shed more light.

On the contrary, we did not observe a similar structural break in the long-term relationship between GDP and passenger numbers in Australia throughout the 2007–2016 period. As shown in Figure 3, we found the financial crisis to have had relatively little effect on the degree of

association between Australian GDP and the number of passengers going through Australian airports. Our Australian forecasts lie only slightly below the actual passenger numbers that resulted from 2008 to 2016, and they share the same growth trend without any statistically significant break in the wake of the financial crisis.

This highlights some interesting differences between the UK and Australian aviation markets. Firstly, the 2008 financial crisis had a smaller impact on the Australian economy, which relies less on financial services (an area that was heavily affected) and more on commodities and mining (areas that were less affected). This is reflected in the fact that Australia never fell into a recession throughout the period. Australia has also

benefited from a fast recovery by its trading partners, especially China, and the fiscal and monetary response of Australian institutions. Finally, Australian airports have not faced similar restrictions to growth as have the UK's largest airports, and it is plausible that this has allowed the strong relationship between the two variables to continue.

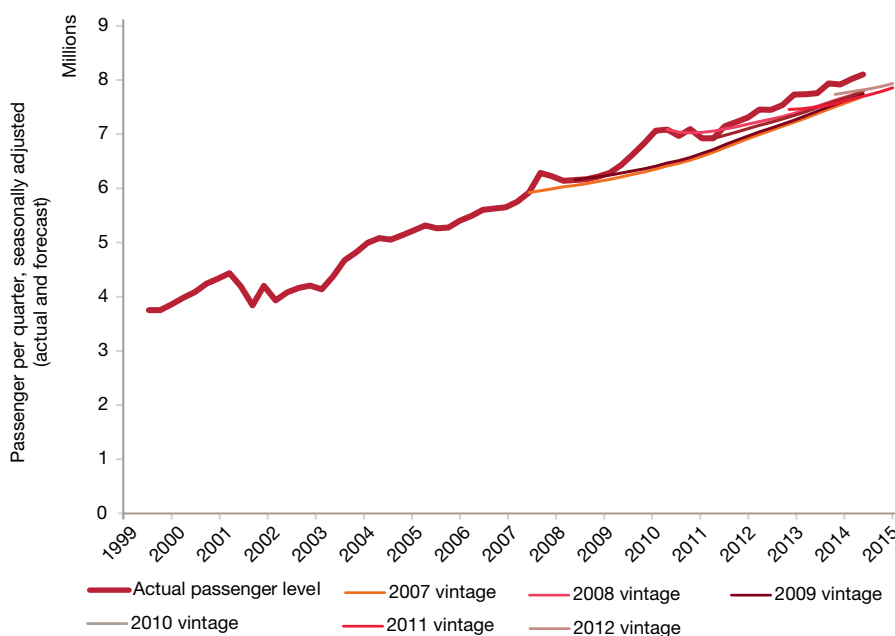
To verify our findings, we also conducted a Supremum Wald test<sup>6</sup> on the UK and Australian data to test whether there had been a structural break in the relationship between GDP and passenger numbers. In the UK dataset, we found a statistically significant structural break in 2009, straight after the financial crisis. In contrast, the Wald test did not find any structural break in the Australian dataset since 2000. The hypothesis that a structural break exists in 2009 has been rejected at 5% significance level.

### **A closer look: aviation demand in individual airports (long term elasticity)**

Using data from the CAA and BITRE, it is also possible to analyse the GDP-passenger level responsiveness at the level of airports. In Figure 4, we show the *elasticity coefficients*<sup>7</sup> of which growths in passenger level in six major airports in the UK and Australia have been associated with GDP growth in their respective host country over the long term. For example, at an airport with an elasticity coefficient of 1.5, we estimate that *on average and in the long run* every percentage point in GDP growth in the host country is associated with 1.5 percentage points of growth in passenger numbers.

We found large variations amongst the long run elasticity coefficients to GDP between major UK airports. Passenger numbers at all four airports we studied exhibited significantly positive relationship to GDP. Heathrow, London's principal international airport where most long-haul flights

**Figure 3: Using Australian GDP figures to forecast passenger numbers passing through Australian airports**



Source: BITRE, PwC analysis

Note: The thick burgundy line represents the actual quarterly passenger level, seasonally adjusted. The thinner lines represent the central scenario of different forecasts we would have obtained if we had carried out the analysis at the beginning of each year between 2007, 2008 and every year between 2010 and 2014.

are based, has been most resilient to fluctuations to GDP. (Our central estimate for its elasticity coefficient is 0.7, i.e. a 1% change in the UK's real GDP is on average only associated with a 0.7% change in Heathrow's passenger number). It is followed by London Gatwick, the second busiest airport in the UK, and then Manchester airport, Britain's busiest airport outside of the London area. In contrast, Stansted, the third largest London airport, which caters mainly for low-cost flights to Europe, has a significantly higher elasticity coefficient.

<sup>6</sup> We used a Supremum Wald test to test the hypothesis that there had been a significant change in the relationship between GDP and passenger numbers in the UK in 2009. This was rejected with a p-value of 0.0000. When analysing the Australian data, the test did not estimate a break date in 2009, i.e. the hypothesis that there was a structural break in 2009 was rejected.

<sup>7</sup> In economics, this is defined as the ratio between the percentage change in passenger numbers and the associated percentage change in GDP of the host country.

**Figure 4: Estimated relationship between growth rates of passenger numbers and GDP**



Source: PwC analysis

Note: We present our point estimate in solid dots, with the 95% margin of error (confidence interval) in a paler shade around it.

There are two plausible explanations for why passenger numbers in Stansted are most responsive to changes in GDP. Firstly, Stansted is dominated by low-cost carriers. These airlines have a higher proportion of leisure passengers, who are more sensitive to fluctuations in the business cycle. Secondly, the effect of an economic downturn may differ across airports. The airline industry may choose to absorb the decrease in demand by cutting capacity in a less preferred airport; for example, the full-service carriers may scale back their Gatwick operations, which started as Heathrow overspill. These slots may then be taken up by budget airlines as they move some operations from Stansted into the more preferred Gatwick. As a result, it is perhaps not surprising that Stansted benefits most from the additional passenger flow that a stronger economy brings, and has been most affected by an economic downturn.

The case at Manchester airport also puts this into context. It is the busiest British airport outside of the London area, and has a more balanced mix between long-haul and European flights as well as between business and leisure customers. While the London airports are substitutes for each other, Manchester is a catch-all airport that serves the North of England with few close alternatives. It is not surprising that Manchester has an elasticity coefficient that lies between the three London airports, despite its passenger number level being comparable to that of Stansted in the last few years.

We then turn our attention to Australia. We estimate that passenger demand at Sydney and Melbourne airports is comparably more responsive to real GDP than Manchester is in the UK, and significantly more so than Heathrow and Gatwick. This might be attributed to two factors.

Firstly, Sydney and Melbourne airports are not close substitutes for each other; they are around nine hours apart in terms of car journey times, and their catchment areas rarely overlap. As a consequence, the order-of-preference effect that may have been in play in the London area is unlikely to be significant between Sydney and Melbourne, and it is not surprising to find that their elasticities are similar to that of Manchester Airport in the UK.

Secondly, the two Australian airports do not face the same capacity constraints that have been rife for Heathrow and Gatwick: new flights are more likely to be scheduled in response to economic growth in Sydney and Melbourne than in Heathrow and Gatwick. This also supports the finding that GDP has been a better predictor of passenger numbers in Australia than it has been in the UK, while other factors, such as capacity constraints, are less influential.

### **Brexit in the Air**

Using the long-term and short-term relationships between GDP and passenger numbers that we estimated for the UK as a whole, we could estimate how the UK's vote to leave the European Union may affect passenger demand in the medium term. In March 2016, before the referendum, the Office for Budget Responsibility (OBR) had published its outlook for the UK economy under the assumption that the UK would remain in the EU<sup>8</sup>, and PwC had worked with the Confederation of British Industry (CBI) to produce an assessment of economic impacts that a vote to leave would entail<sup>9</sup> under two scenarios: (i) the UK reaches a trade agreement with the rest of the EU similar to that with Canada (the 'FTA scenario') and (ii) the UK does not reach any trade agreement with the

<sup>8</sup> In its *Economic and Fiscal Outlook* (March 2016), the OBR explicitly set out that it has 'made no assessment of the long-term impact of the potential long-term impact of 'Brexit' on the economy' (para. 1.27).

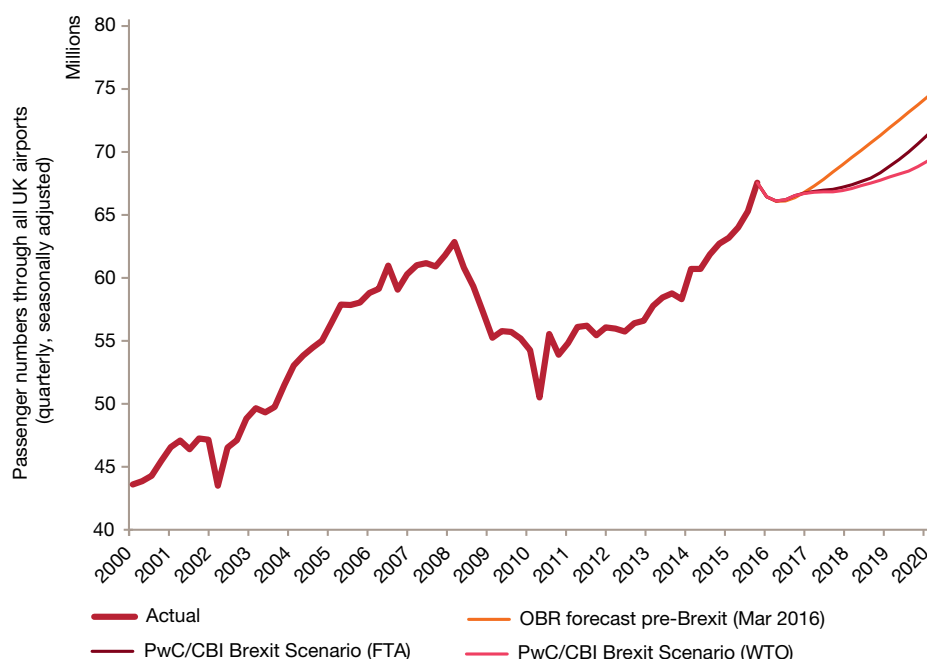
<sup>9</sup> The full PwC/CBI report, *Leaving the EU: Implications for the UK economy*, can be found at <http://pwc.to/1WxjIXc>.

rest of the EU, and trade between the two entities revert to World Trade Organisation rules (the ‘WTO scenario’). We derived forecasts for passenger flows through UK airports under these scenarios. (See Figure 5.)

We found that on a quarterly and seasonally adjusted basis, by the end of 2020 and compared with the counterfactual that the UK had voted to remain in the EU, level of passenger demand at UK airports would be **3.9% lower in the FTA scenario** and **7% lower in the WTO scenario**. In annual terms, compared with our median estimate of the counterfactual ‘Remain’ case, under which there would be 291.8 million passengers in the year 2020, there would be 11.9–19.5 million fewer passengers across UK airports in the same year under our two Brexit scenarios. In terms of growth, our analysis suggests that air passenger levels would increase year on year by 1.3%–2%, instead of 2.8% under pre-Brexit forecasts.

The International Air Transport Association (IATA) predicts a slightly lower Brexit effect of 1%–1.5% per annum over the ‘near term’, resulting in a slightly lower impact by 2020 of 9.03–15.05 million<sup>4</sup>; however, this discrepancy may be due to the IATA using estimates of income elasticity relevant to developed markets as a whole rather than solely to the UK. Despite the different estimates, however, it is clear that Brexit will impact air passenger numbers significantly in the near to medium term.

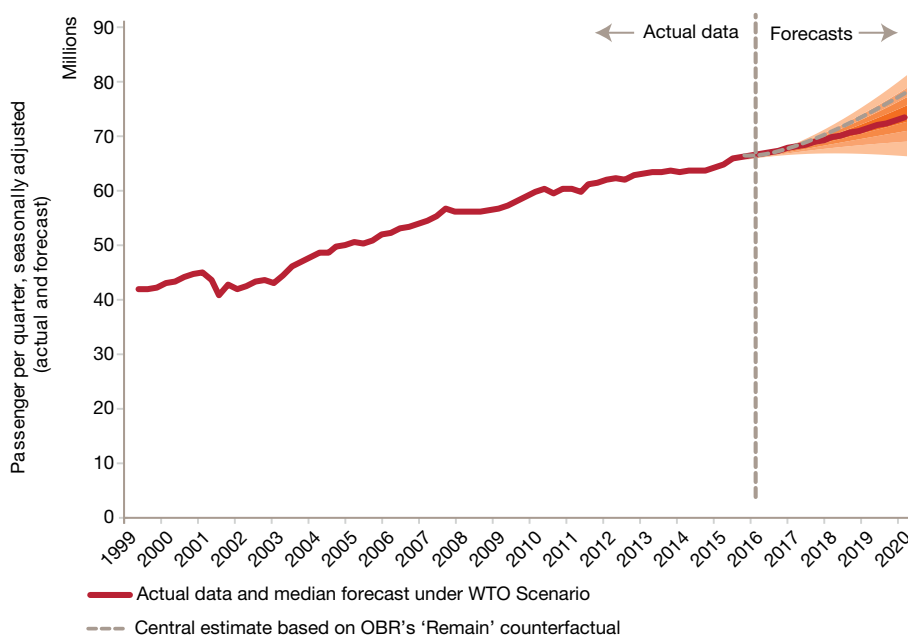
**Figure 5: The impact of Brexit on air passenger forecasts**



Source: OBR, CAA, PwC analysis

It is important to note that uncertainty around our forecasts increases as we move deeper into the future. To reflect this, we also present the margins of error around our central estimates under the more pessimistic WTO scenario in different shades in Figure 6.

**Figure 6: Uncertainty around our forecast**



Source: OBR, CAA, PwC analysis

Note: The central estimate and the fan around it is calculated with PwC/CBI's assessment of Brexit's impact under the WTO scenario. The grey dashed line displays the median estimate using no-Brexit growth forecasts from the OBR.

## The way ahead

While we feel our analysis provides some interesting and relevant insights into the GDP-air traffic demand relationship, it should not be considered exhaustive. We have to some extent touched on the effect that crises can have on traffic growth; our analysis shows a clear downward level shift following the 2008 financial crisis in the UK, but not in Australia. Furthermore, the results for the responsiveness of passenger numbers at individual airports to GDP growth is intuitive: airports that have higher proportions of leisure travellers and that are less preferred in the same catchment area are more responsive to changes in GDP. We are also able to apply our models to assess the impact of Brexit on air passenger numbers.

However, despite having modelled the impact of GDP on air traffic demand, there may be other important factors that may affect air traffic and should be taken into account. In particular, the level of air fares may be a valuable addition to our model. It could be argued that at least part of the growth in air traffic in the past two decades has been driven by the rise of low-cost carriers and the decrease in air fares associated with them. Indeed, the DfT observed 'there is typically a downwards trend in air fares'. Our analysis may suggest that while the LCC boom drove UK traffic in the mid-2000s, the reversion back to pre-crisis levels has been slow, with LCC penetration having a much lower effect as a result of relative market saturation.

Geographical features of a country also play a key role in air traffic demand. Propensity to fly tends to be higher in island countries, countries with relative isolation and limited land transport, and countries that are long and thin as land transport such as high-speed rail would be more challenging or costly to implement. This is one of the key drivers for air traffic demand in the UK: As an island country, travellers to the European continent have limited options other than to travel by air, with the exception of the channel tunnel and ferries for Western Europe. Similarly, Australia is sparsely populated across a large expanse of land, domestic flights in Australia face less competition from other modes of transport than in Europe and East Asia.

A final consideration is that of the hub status of an airport. Hubs such as Heathrow, Singapore and Dubai offer air connectivity far out of proportion to their size, owing to the availability of air services and geographical location. For the UK, Heathrow continues to act as a hub but still faces competition, particularly from the Middle East (e.g. Dubai). For this reason, we intend to investigate the responsiveness of GDP to passenger numbers at major hubs in the Middle East and Southeast Asia in next year's report, which will give more insight into the evolution of air passenger traffic worldwide.

In conclusion, having studied in detail some of the dynamics of aviation growth in the UK and Australia, we found GDP growth and air passenger traffic are strongly correlated, but the relationship is ever changing. However, we note that other drivers such as demography, competition and geography are important as well. There needs to be more research into other factors that determine demand for air traffic globally.

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# ***Air connectivity: Why it matters and how to support growth***

Claudia Bottini, PwC UK and Hayley Morphet, PwC Australia

Global air travel has changed considerably over the past decade. Thanks to major improvements in technology, air travel is more efficient, making distances between countries seem shorter than ever. Meanwhile, the continued growth of low cost carriers (LCCs) and their increased penetration into emerging markets has made air travel more accessible, while the rapid expansion of Middle East hub carriers has changed intercontinental travel patterns. As a result, air connectivity has also changed.

But what is air connectivity exactly? The International Civil Aviation Organisation (ICAO) defines it as an indicator of a network's concentration and its ability to move passengers from their origin to their destination seamlessly<sup>1</sup>.

Air connectivity is key to unlocking a country's economic growth potential, in part because it enables the country to attract business investment and human

capital. An increase in air connectivity also spurs tourism, which is vital to many countries' economic prosperity.

By understanding how air connectivity is measured, how it has changed, how it relates to economic growth, and what drives it, key aviation stakeholders (i.e. States, airports and airlines), can make strategic decisions on how to enable and unlock the air connectivity potential of a country.

## ***How is air connectivity measured?***

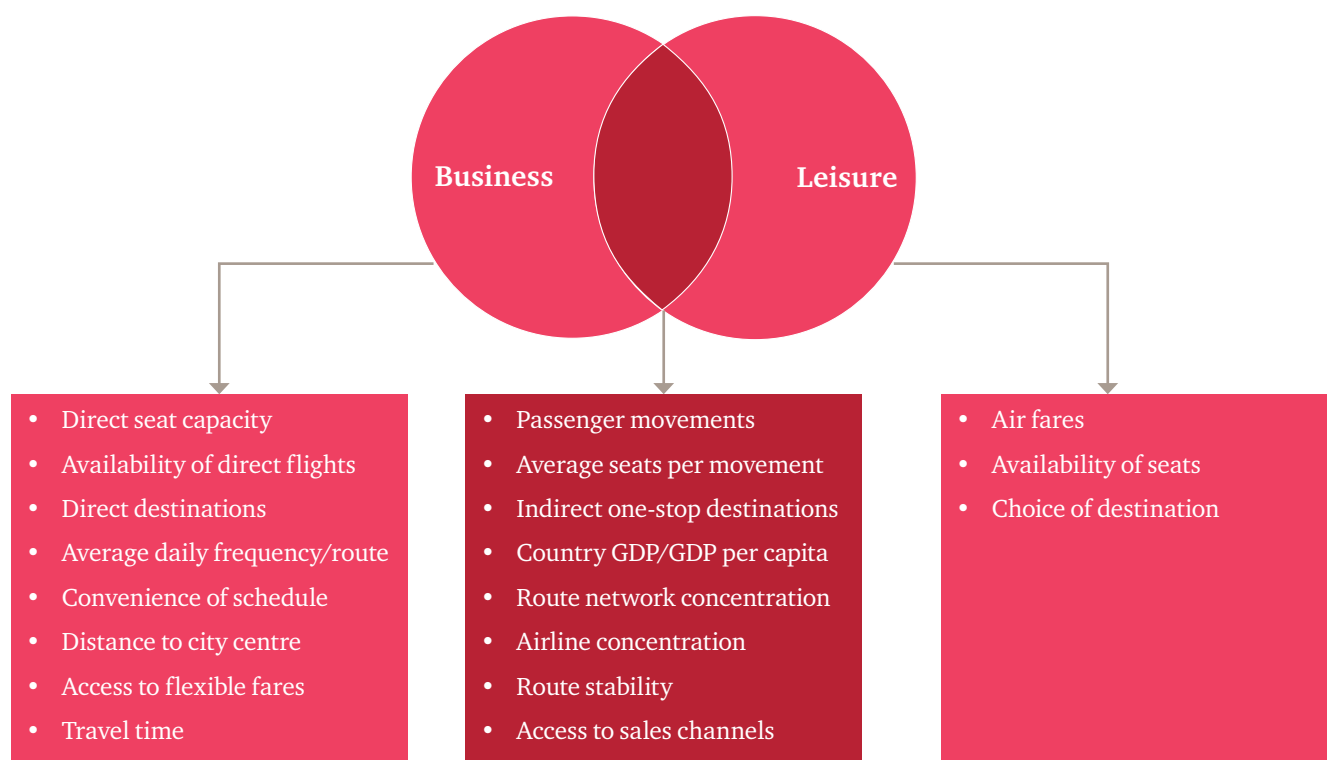
We can use a variety of measures, at various levels of granularity, to measure air connectivity. These measures – including total passenger movements, air fares, the number of direct destinations and travel time – can serve as standalone proxies or may be combined to create a measure capturing different features of the air-transport market. (See Figure 1.)

<sup>1</sup> ICAO (2013), Worldwide Air Transport Conference (ATConf/6-WP/20).





**Figure 1: Air connectivity measures**



Source: PwC analysis

Note: VFR is a subset of leisure travel. However, this segment differs from leisure in that passengers don't have a choice of destinations and appear to be less sensitive to price. (Price, however, may determine how frequently they travel).

Travellers have different priorities, depending on the purpose of their journey. That means we can use different measures to assess air connectivity for each passenger segment. For instance:

- **Business travellers** tend to be time sensitive and relatively indifferent to fare levels. Frequent and flexible service that enables passengers to quickly change flights to a more convenient time, coupled with easy surface accessibility, matter most to this segment. Thus air connectivity for them could be measured by frequency of service, convenience of schedule, travel time, number of direct routes available and proximity to the city centre.
- **Leisure travellers** care more about fares, with cost-effectiveness often the most important factor in decisions about whether to travel and where, especially for short breaks. An unacceptably high fare could cause them to change their mind about their destination. Measurements of air connectivity for this segment should therefore include fares.

- **Travellers visiting friends and relatives** fly primarily to see loved ones. In some markets, this category of travel is substantial. Passengers travelling for this purpose tend to consider fares a major factor in determining how frequently they travel. However, unlike leisure passengers, they don't have the option of changing their travel destinations if fares are too high.

The importance of air connectivity has led to the development of a number of indices in aviation economics literature. (See Table 1.) Each measure aims to capture a range of factors influencing connectivity. At the same time, aviation stakeholders looking to understand the integration of country (or city) within the global air network can tailor their choice of air connectivity indices to suit their needs by identifying the criteria most important to the country (or city) they're interested in and by developing an integrated index which takes multiple variables into account.

## How has air connectivity changed?

Over the past 10 years, the aviation industry has experienced the effects of various shocks (such as terrorist attacks, natural disasters and pandemics), a weak economy and rising fuel prices. The industry has shown its resilience by adapting itself to satisfy the needs of an ever-evolving market.

Air traffic growth, once led by North America and Europe, is now fronted by the Middle East and Asia-Pacific regions, which have experienced strong growth over recent years.

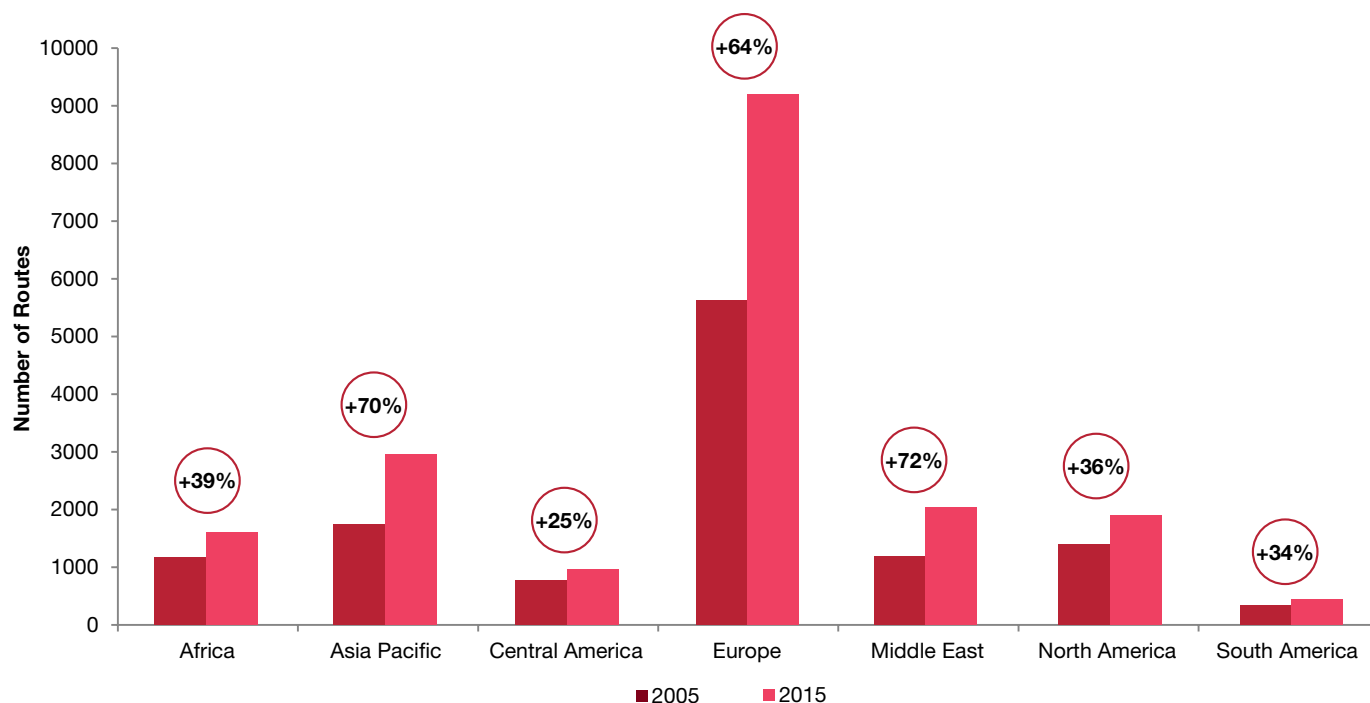
If we consider the number of direct international routes as a proxy to measure connectivity at a regional level, we can see that a significant increase was observed in the Middle East and Asia, with Europe's routes increasing by 64% since 2005 as a result of the increased penetration of low-cost carriers and the subsequent increase in point-to-point services. (See Figure 2.)

**Table 1: Air connectivity indices in aviation economics literature**

Measure	Description
<b>York Aviation Business Connectivity Index</b>	Captures the economic importance of destinations and measures value of connectivity to businesses
<b>Netscan Connectivity Index</b>	Captures seat capacity, accounts for direct and indirect connections and for transfer time as well as potential delay time when connecting
<b>IATA Connectivity Index</b>	Captures the importance of destinations based on the size of the final destination airport
<b>World Bank Air Connectivity Index</b>	Weights value of a route based on the number of onward connections available reflecting benefits of hubs
<b>World Economic Forum Connectivity Index</b>	Presents data on scheduled available seat kilometres per week in 2012 for a sample of 144 countries

Source: York Aviation, Netscan, IATA, World Bank, World Economic Forum

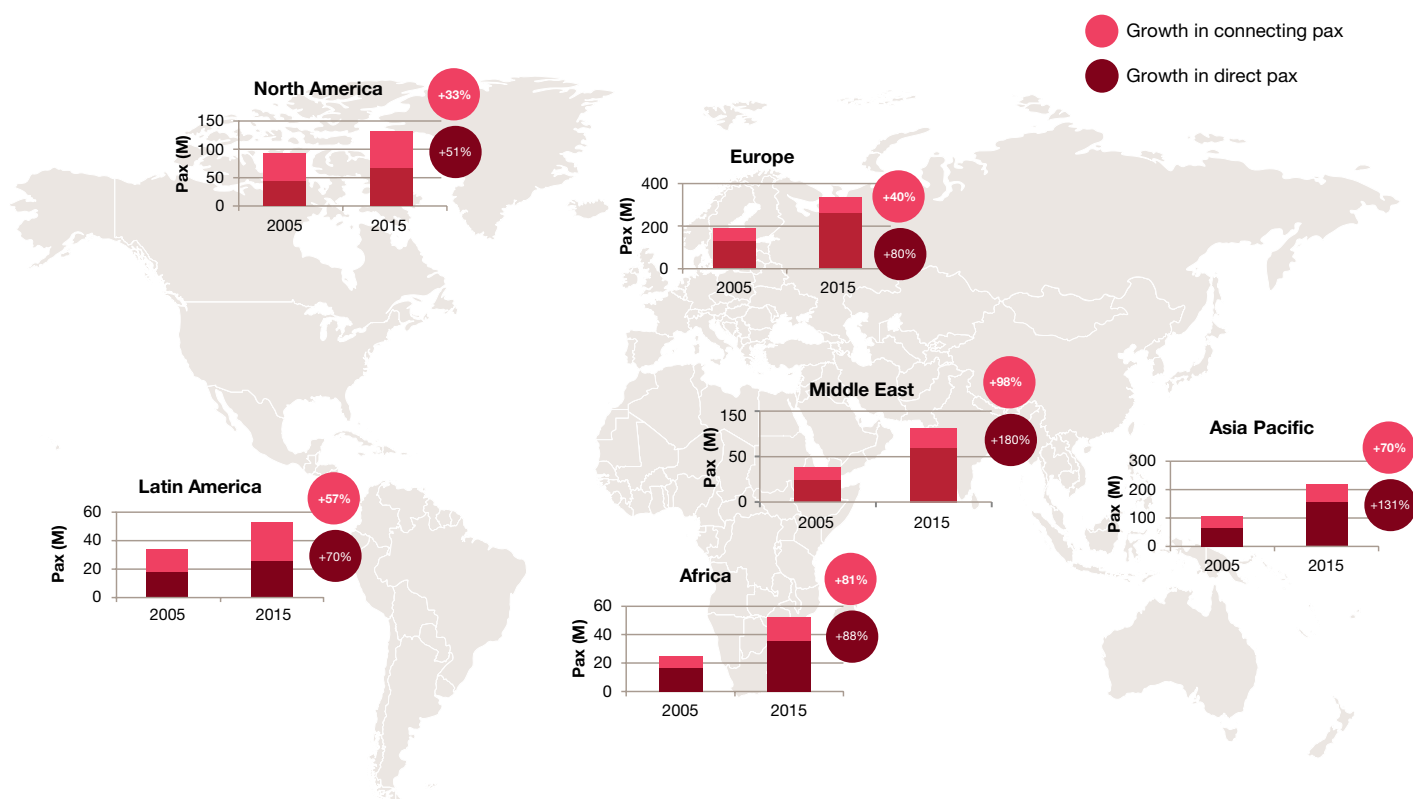
**Figure 2: Number of international routes by region: 2005 and 2015**



Source: Milanamos PlanetOptim Future, PwC analysis

Note: the chart only looks at international routes excluding domestic in-country traffic

**Figure 3: Direct and connecting passenger traffic, 2005 and 2015**



Source: Milanamos PlanetOptim Future, PwC analysis

Note: The figure shows the pattern of travel of passengers originating from each region. It excludes domestic traffic.

Assessing direct and connecting passengers further highlights the aggressive expansion of the Middle Eastern hubs, which experienced larger growth in passenger demand than any other region around the world. (See Figure 3.) At the same time, Europe and the Asia-Pacific region saw strong growth in the number of direct passengers, driven mainly by the significant penetration of LCCs in that market and a subsequent increase in the number of point-to-point services. Latin America and Africa have also shown considerable growth, as opposed to the more mature North American market, which has seen a moderate increase in the number of passenger movements.

### **How are air connectivity and economic growth linked?**

Aviation generates significant benefits for the global economy. In 2014, it contributed US\$2.7 trillion to the global GDP (3.5%). Direct benefits (i.e. employment and economic activity generated by the air transport industry) are estimated at about US\$664.4 billion; indirect benefits (generated by employment and economic activity of suppliers of the air transport industry) US\$761.4 billion.<sup>2,3</sup> Aviation also plays a key role in enabling the economic growth of countries which rely on major hubs such as Singapore and Dubai. In Dubai, for instance, aviation generates about 27% of the city's GDP.<sup>4</sup>

Therefore, we can see how improved air connectivity plays a large role in creating such economic value. Obviously, it benefits travellers by giving them access to a wider network as well as more frequent and better connected services. But it also can strengthen a country's economy over the long haul, boosting productivity through its positive impact on businesses. For example:

- Increased connectivity reduces air travel times, giving businesses access to a wider marketplace.
- Increased connectivity makes it easier for managers and executives to oversee far-flung operations, which infuses efficiency into those operations.

<sup>2</sup> Air Transport Action Group (2016), *Aviation Benefits Beyond Borders*.

<sup>3</sup> Note: Other benefits generated by aviation include induced and tourism catalytic benefits, which in 2014 made up for the remaining US\$1,247.4 billion.

<sup>4</sup> 'Quantifying the Economic Impact of Aviation in Dubai', Oxford Economics, 2014

<sup>5</sup> PwC (2013), *Econometric analysis to develop evidence on links between aviation and the economy*, prepared for the UK Airports Commission, <https://www.gov.uk/government/publications/airports-commission-interim-report>.

- Better transport linkages enable investment and human capital to flow more freely across borders, improving returns on investment for some projects.

With such insights in mind, PwC conducted an econometric study for the UK Airports Commission. The study used seat capacity as a proxy for air connectivity to estimate the impact of improved connectivity on the UK's economy. The study revealed that a 10% increase in seat capacity could improve:<sup>5</sup>

- **Short-term GDP** by 1%.
- **Tourism** by 4% within the UK and 3% among UK tourists travelling abroad.
- **Trade** by 1.7% in terms of UK product imports and 3.3% in terms of UK product exports. UK service imports and exports would also improve by 6.6% and 2.5% respectively.
- **FDI** by 4.7% in terms of increased UK FDI inflows and by 1.9% in terms of increased UK FDI outflows.

## What drives air connectivity?

Four main factors enable air connectivity: geography, airport infrastructure, airline models, and a country's regulatory and economic frameworks. These enablers all play an important role in ensuring that a country can cement or expand its global air network to enhance air connectivity.

### Geography

Air connectivity is especially important to countries with isolated air-travel markets (such as islands and large geographical areas) where passengers have few viable alternatives to air travel. However, a country's geographical location can enhance its ability to develop a well-connected network. Examples include Singapore; Hong Kong; Seoul; the Middle Eastern hubs of Dubai, Abu Dhabi, and Doha; as well as the emerging Turkish hub of Istanbul – all of which have exploited their favourable position in the global air-travel network to build strong hubs with far-reaching spokes.

If we look at Europe, Asia and the Middle East, we can see how each of these regions has capitalised on its geographical location by capturing intra-and inter-regional flows:

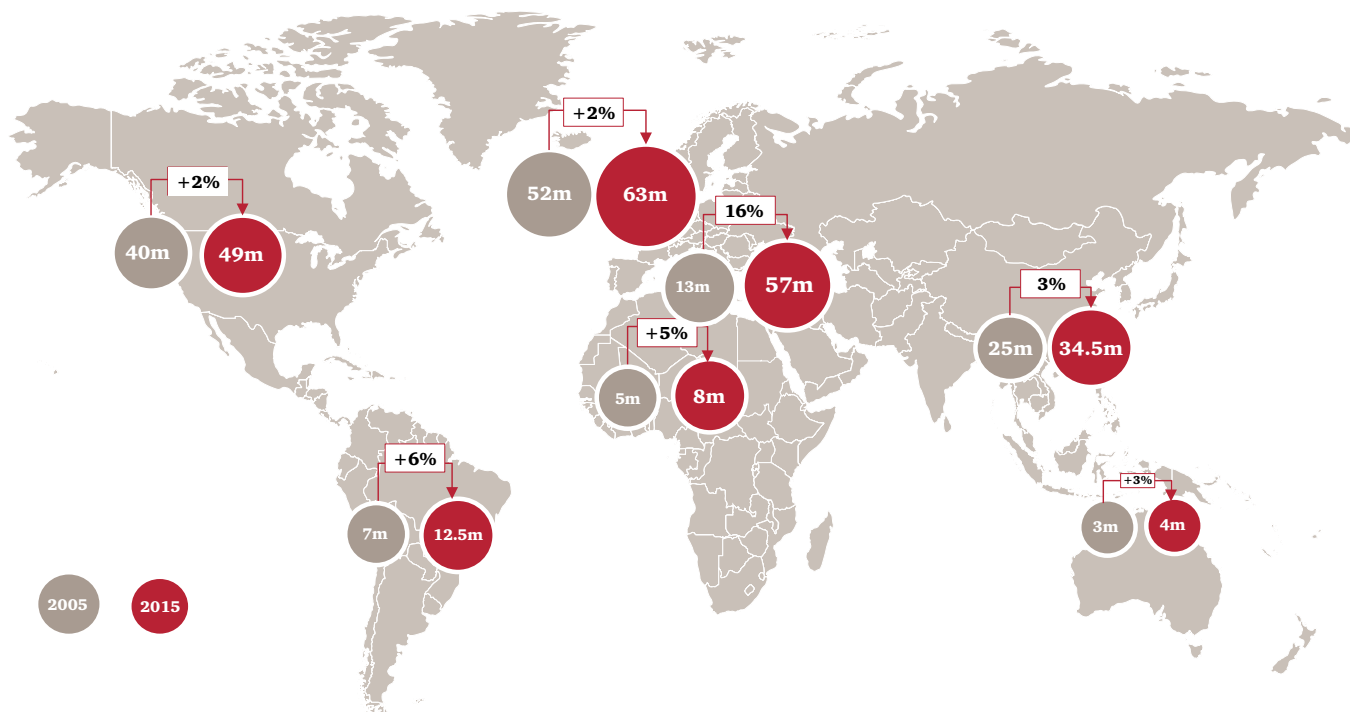
- **Europe** – Within a four-hour radius, the EU's main hubs can draw mainly from European and possibly North African destinations. On longer haul routings, the EU is a convenient intermediate point for (especially) East Coast<sup>6</sup> North American traffic to Asia.

- **Asia** – Asian hubs such as Singapore and Hong Kong have traditionally enjoyed advantages with respect to traffic routes between Europe and Australasia, and with respect to other points in Asia where traffic to and from Europe is less developed (such as Indonesia and Vietnam).
- **Middle East** – Within a four-hour radius of Middle Eastern locations lie the eastern parts of Europe and Africa as well as the highly populous markets of the Indian subcontinent. A range of destinations fall within the scope of a 12-hour flight from Dubai, including China, Southeast Asia, Australia, and the vast majority of the African continent. However, the majority of the Americas lie just outside this radius.

Middle Eastern countries have excelled at marrying a strong national carrier with a route network that supports it by leveraging the advantage that comes from being located at the mid-point of major traffic flows. Inter-regional transfer traffic at Middle Eastern hubs has in fact grown 16% per year in the last decade – the largest such growth in the world. (See Figure 4.) The strategy adopted by Middle Eastern countries has catalysed development of hub services, which provide passengers with benefits such as more convenient travel itineraries, more frequent flights, and a wider range of destinations available within specific flight times.

<sup>6</sup> Although West Coast North America is also within the 12-hour radius of Europe, flights can reach much of Asia direct in the westerly direction.

**Figure 4: Intercontinental transfer traffic**



Source: Milanamos PlanetOptim Future, PwC analysis

Note: The chart only shows inter-regional transfer passengers; it excludes direct passengers between regions as well as any passengers requiring more than one connection and passengers travelling within the region. Turkey has been classified as Middle East.

### Airport infrastructure

Airports provide the connectivity and access required for a modern economy, enabling businesses to capture overseas opportunities and facilitating the coming and going of tourists – all of which fuel economic growth.

Transport infrastructure acts as a facilitator of growth unlocking latent demand. Moreover, enhancement of transport infrastructure, combined with development of an extensive network, can decrease general travel costs for passengers and goods – thanks to lower fares, shorter travel times, and more seamless connections.

Analysis of what's happening in emerging countries can shed light on the importance of airport infrastructure for improving air connectivity to foster economic growth. For instance, some countries such as Indonesia, India, and Brazil have registered brisk growth in recent years, driven by increases in population and economic wealth. But inadequacies in their current airport infrastructure are preventing them from fully capitalising on their growth. Such infrastructure lacks the required capacity, but boosting that capacity will require considerable capital expenditure.

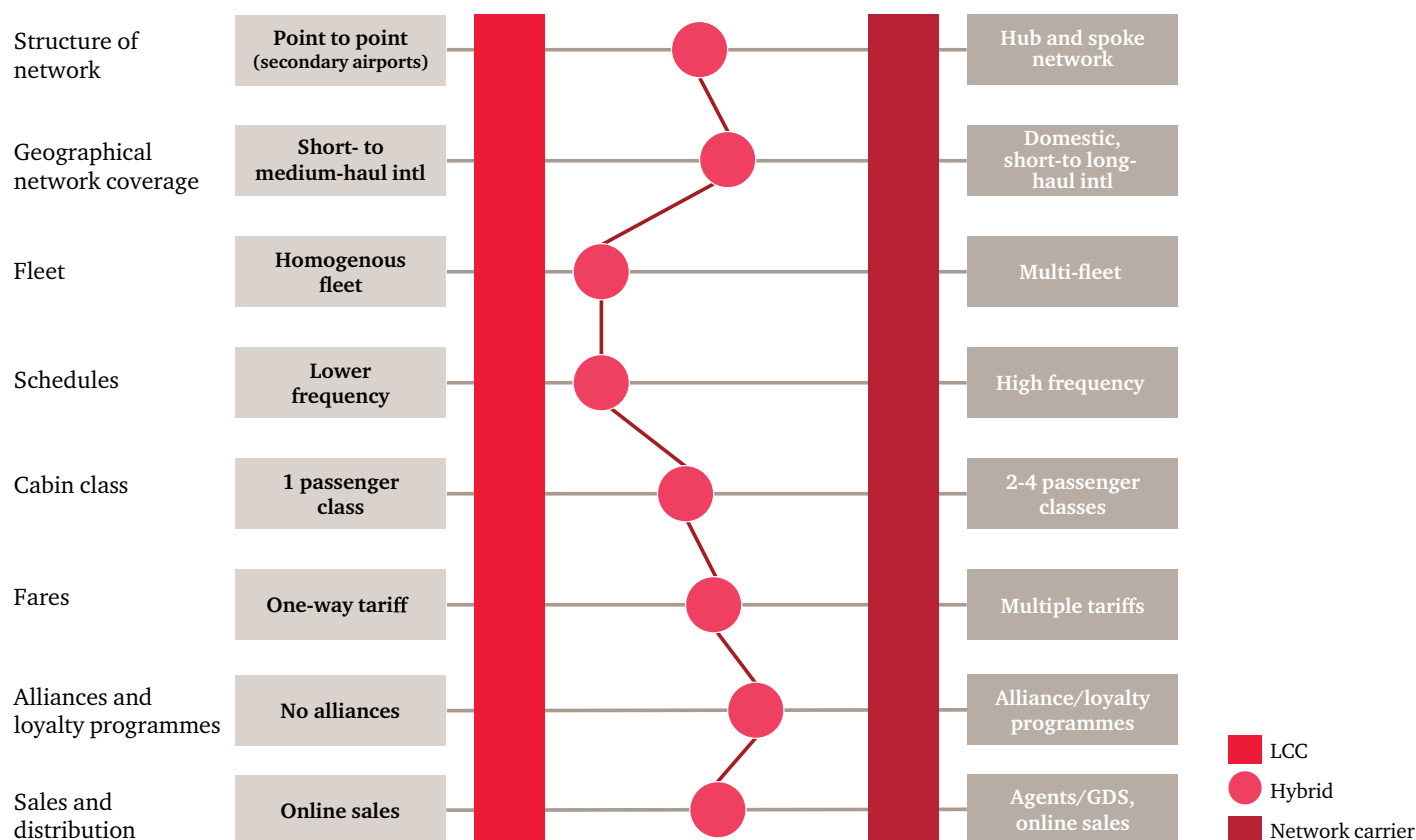
## Airline business models

Airlines' business models can directly affect air connectivity. Indeed, over the past decade, carriers have adopted new models to survive in the face of often unfavourable market conditions. Such models fall into three broad categories: low-cost carrier, network carrier, and hybrid. (See Figure 5.)

In the past, LCCs have targeted mainly the leisure passenger segment. The low-cost model has traditionally provided a 'no-frills' service that can create demand by offering very low fares and by serving destinations that were previously not served or only connected via a hub. The availability of low fares has opened the market to a wider group of consumers and has enhanced connectivity by establishing services to and from secondary airports.

Network carriers mainly operate radial networks centred on their main base or hubs. Their networks provide a wide range of destinations and frequent and flexible services that meet the needs of both business and leisure travellers. A hub-and-spoke model consolidates traffic through a hub and allows for lower-density routes to become viable that may not have been viable as a point-to-point service. This helps to provide a country (or city) with important links and increased frequency of services to the global air travel network.

**Figure 5: Three airline business models**



Source: PwC analysis



With the most recent global financial crisis, many business travellers have gravitated toward LCCs for short-haul travel. To capture this new market, some airlines are transitioning to a hybrid model, providing reasonable fares combined with the flexible and frequent service business travellers want.

Countries that can rely on strong network carriers that use their hubs efficiently are more likely to achieve greater air connectivity than countries served only by LCCs. However, this likelihood also depends on what type of air connectivity is central to a nation's economy; specifically, what their leisure- and business-travel markets want.

### **Regulatory and economic framework**

Public policy and regulation can powerfully facilitate air connectivity, or hinder it, by constraining development of a country's air-transport network. Since the 1940s, international air services have been governed by a complex web of bilateral air services agreements (ASAs) between States. Such agreements determine the number of airlines that may compete in any given market, the routes that airlines may operate, capacity (in terms of frequency and often the number of seats offered) that airlines may provide, and airfares. In recent years, some States have moved to liberalise ASAs; for example, through so-called 'open skies' agreements. Yet despite these open-access models, restrictions remain. Notably, when it comes to ownership and control of airlines, most ASAs allow governments to reject the designation of any airline that is not owned and controlled by the designating party. For the foreseeable future, the prospect of 'normalisation' of air transport, particularly with respect to consolidation or cross-border mergers of airlines, remains limited.

Governments trying to decide the degree to which they want to liberalise their ASAs would generally take a number of factors into account. For example, a country's geographic features influences the extent to which liberalisation will boost air travel and connectivity. Geography also dictates the features of a country's air-travel market; in particular, whether it is mainly a domestic market, an international market, or a transit point for global traffic flows. The attractiveness of the country to tourists and businesses also matters, with population affecting the size of the potential market. For instance, geographically isolated countries may be more likely to see liberalisation as being in their economic interest, especially if they're not attractive to tourists or they don't have the population density needed to build a competitive air-transport network.

Size and geographic location may also influence a government's attitude toward liberalisation of airline ownership provisions. Unfortunately, ownership decisions can't be made unilaterally. Countries need agreement from ALL the bilateral partners who are most significant to their markets – or they risk having airlines with foreign ownership rejected. This is a problem of growing significance for governments seeking fresh capital investment in their airlines. As former flag carriers experience distress, the need to maintain air connectivity will raise new questions about the role of public – and private-sector investment in the industry.

### **How can stakeholders facilitate connectivity growth?**

With the exception of external factors such as geography that are beyond one's control, stakeholders have the ability to influence many of the factors

that enable achievement of greater air connectivity. For instance, emerging countries can achieve greater air connectivity by:

- Focusing on the development of aviation infrastructure (such as airports) – attracting new investors and ensuring that enough capacity is created to accommodate demand.
- Ensuring that airlines continue to establish and build up their networks to support the linkages a country has with the rest of the world.
- Developing regulatory and economic frameworks which reflect the characteristics and needs of the country, whilst at the same time fostering air transport growth.

On the other hand, mature economies would need to ensure that air connectivity is sustained by:

- Maintaining the current aviation infrastructure (such as airports) and ensuring any need for additional aviation capacity is promptly addressed to avoid loss of air connectivity to other competing neighbouring countries.
- Ensuring that airlines continue to find new routes to enhance their network connectivity, which is vital to the success of an airline. These opportunities may be found in emerging markets.
- Ensuring that regulatory and economic frameworks enable continued growth.

The importance of air connectivity to a country's economic prosperity calls for stakeholders to work together and take the right steps to improve or maintain the global position of a country (or city) within the global air network.

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# ***Aeronautical charges and air traffic demand risk: what is within our control?***

Hayley Morphet, PwC Australia and Claudia Bottini, PwC UK

Airports are an extremely high profile part of a country's critical national infrastructure and bring a complex network of stakeholders, including owners, operators, governments, regulators, airlines and local community. Airports also provide a wide range of transport and business services, with extensive supply chains intertwined with national and regional economies. Governments place focus on airport infrastructure as a facilitator for connectivity and economic growth – making it important to understand the impact an airport has on regional and local economies and communities.

Airports face increasing service expectations (from both passengers and airlines); regulator-imposed constraints on aeronautical charges; and the need to fulfil a national, regional, or municipal development role to drive efficiency, service quality improvement, and passenger growth.

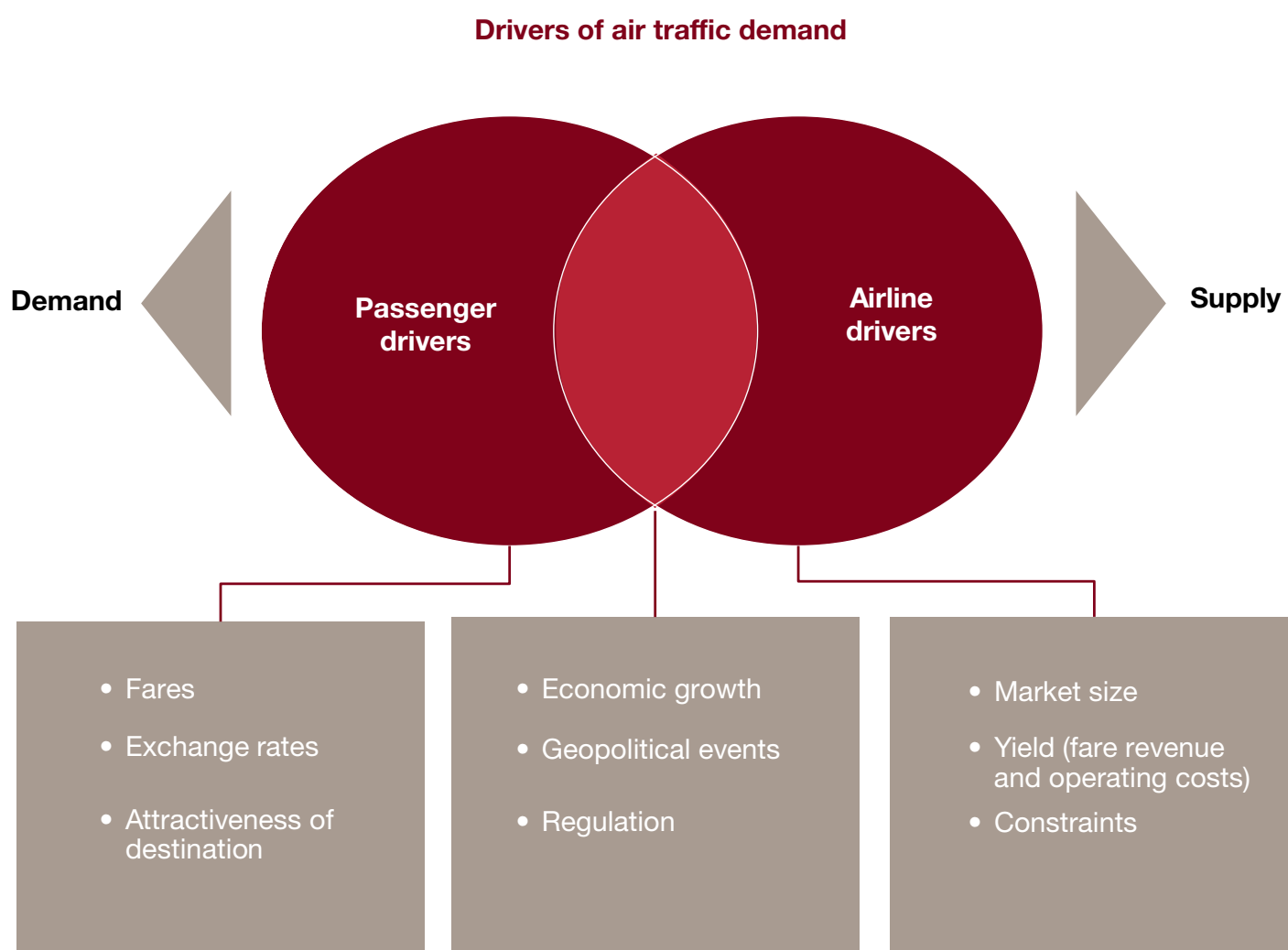
The global trend towards airport privatisation and increased private-sector participation continues as governments look to transfer potential capital costs to the private sector and seek greater commerciality in airport operations. Private financial investors look at airport infrastructure as a generator of stable, long-term cash flows as well as an opportunity to participate in commercial and property developments. This has led to a transformation of how airports manage risk and optimise profits.

Air passenger growth is the key driver of airport value and is subject to a range of demand and supply side factors and risks. (See Figure 1.)

Airlines and airports have very little control over many of the drivers impacting their market – including fluctuating fuel prices, economic conditions that affect consumer and corporate appetite for travel, geopolitical incidents and inconsistent regulatory costs and policies. How does the industry better understand how to respond to these market conditions, what is within their control, and how do they account for risk?

In our paper ‘Economic growth and air traffic: A look ahead’ (see page 13), we address the key risk to demand – economic growth. In this paper, we explore the question of whether aeronautical charges set by airports and regulators influence network decisions by airlines and therefore expose the airport to demand risk.

**Figure 1: Drivers of air traffic demand**



Source: PwC analysis

## Impact of charges on passenger demand

Aeronautical charges are set by airports and regulators (where applicable). Changes in the level of charges are typically linked to regulation, market power, expansion, cost of capital and investment. There is empirical evidence that the impact on demand of changes in passenger charges (either airport charges or passenger taxes) can be significant. Case studies have been considered in order to understand how demand may respond to changes in passenger charges. It should be noted that it is challenging to isolate the impact from other factors.

**Stansted Airport** increased its charges per passenger by 74% between 2006–2007 and 2007–2008 following the regulatory review. Between 2006–2007 and 2013–2014, Stansted's share of the London air passenger market declined from 17.4% to 12.9%. Ryanair, Stansted's key customer, reduced seat capacity from Stansted by 9% while simultaneously doubling its total network capacity.<sup>1</sup> In the press, Ryanair has often cited increases in aeronautical charges as the reason for these reductions.<sup>2</sup> In 2013, Ryanair and Stansted signed a 10-year agreement to lower airport charges and raise airline growth targets. This resulted in a return to growth of Ryanair services between 2013–2014 and 2015–2016 of 26% in terms of seat capacity.

<sup>1</sup> Source for Stansted Airport case study: '13. Cost and Commercial Viability: Funding and Financing', PwC for Airports Commission, 2014 ([https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/372807/funding-and-financing.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/372807/funding-and-financing.pdf))

<sup>2</sup> See for example: Josie Ensor (2 March 2013), 'Ryanair to cut down flights from Stansted over landing fee row', *The Telegraph*, <http://www.telegraph.co.uk/finance/newsbysector/transport/9904233/Ryanair-to-cut-down-flights-from-Stansted-over-landing-fee-row.html>, accessed 11 November, 2016.

<sup>3</sup> Source: IATA Airport Charges Monitor.

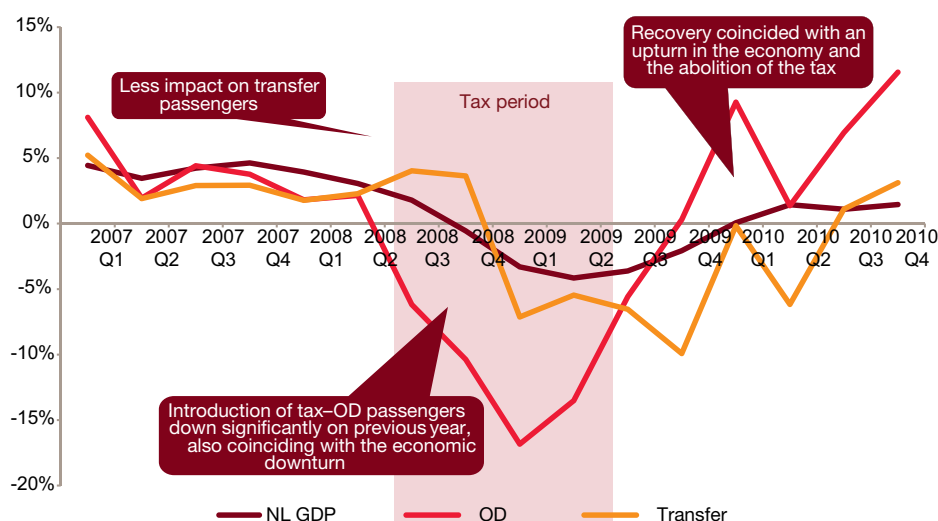
<sup>4</sup> Source: '13. Cost and Commercial Viability: Funding and Financing', PwC for Airports Commission, 2014 ([https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/372807/funding-and-financing.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/372807/funding-and-financing.pdf))

The **Netherlands Air Passenger Tax** was introduced in July 2008 and imposed on departing passengers (transfer passengers and freight were exempt). The tax was levied at the rate of €11.25 for short haul traffic and €45 for all other traffic.<sup>3</sup> From the point of view of the airline, a tax can be seen as largely equivalent to an increase in aeronautical charges. Although the impact was disguised by the downturn in the economy, there was a substantial reduction in terminating (origin-destination) passengers around the same time (i.e. by 8%–10% more than the downturn in transfer passengers).<sup>4</sup> After 12 months the tax was withdrawn, suggesting that the Dutch government considered that the demand reduction was caused, at least in part, by the tax; demand appears to have recovered since. (See Figure 2.)

In 2012, charges at **AENA's** airports in Spain were increased, with the key airports of Madrid seeing an increase of 60% and Barcelona of 50%.<sup>7</sup> While Barcelona's traffic proved to be relatively resilient (largely as a result of the growth of Barcelona based carrier Vueling), demand at Madrid declined significantly over the years following the increase (likely due, in part, to restructuring activity at Iberia). This suggests that demand responses to aeronautical charge changes may be different across different airports, but also highlights the difficulty in assessing precisely what is caused by the impact of changes in aero charges rather than other factors (e.g. airlines at Barcelona may have absorbed the increases, while at Madrid, these may have been passed through to the passenger).

Economic regulation of **Manchester** and **Stansted** airports was removed in 2009 and 2014 respectively and **Gatwick** airport regulation was transformed<sup>5</sup> in 2014. It is worth noting that at various points in their history, Manchester and Stansted airports were unable to price up to their regulated cap<sup>6</sup>. This suggests that aeronautical charges can be an important factor for airlines when considering where to fly.

**Figure 2: Quarterly change in passengers at Amsterdam Schiphol Airport and Netherlands Real GDP Growth (compared with same quarter previous year)**



Source: Schiphol Group, OECD

## Relative importance of airport charges

The position on demand risk is finely balanced and varies from airport to airport depending on their market position, network and airline customer base.

How important the level of airport charges depends on the operating model for the airport, the nature of the destination, and price sensitivity of airlines operating at the airport. For example, airport charges at an airport with majority short-haul, LCC traffic is likely to make up a comparatively higher proportion of fare revenue for the flight – which means a shift in airport charges is likely to be more significant. Also, airports where there's a potential substitution for a different destination (e.g. leisure) also may face higher price sensitivity for its airlines.

We considered the relative importance of airport charges compared with average per passenger revenues received by airlines for a selection of 14 airports and airport groups with greater than 10 million passengers per annum. Based on ticketing data from Milanamos PlanetOptim Future, the current estimated average one-way fare (excluding taxes) for passengers at these airports ranged from US\$112 to US\$526. Aeronautical charges range from US\$7.90 to US\$33.90 per passenger for the airports included in the analysis. This implies the overall significance of aeronautical charges is 2.5%–12.5% of average air fares. (See Figure 3.)

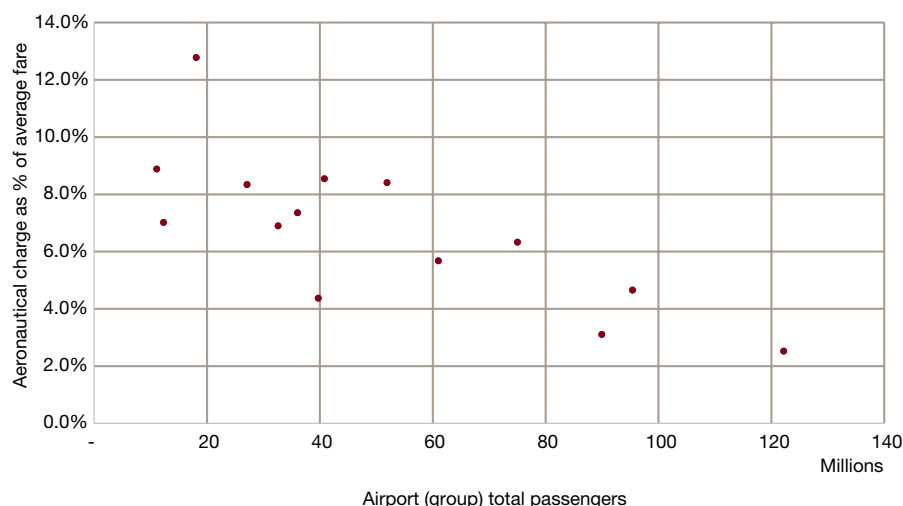
Where airports have some freedom to set charges, this needs to be considered in the context of its customers and the market in which the airport operates. The challenge for airports is how to optimise charges without negatively impacting on revenues. For example, can an airport differentiate their charging or offer incentives to target specific types of traffic (such as those that are more/less price sensitive)?

## Capacity constraints

There is a question of whether airports that are constrained have more market power and hence can charge a higher rate for use of the airport. One argument is that the airport with higher utilisation is more efficient and can better cover its investment and operating costs. However, in some cases, higher utilisation drives complexity and increases required investment; therefore, charges are increased in order to cover current (or future) capacity costs.

We looked at runway utilisation and level of charges for a selection of European airports over time. The analysis indicates that congestion is associated with higher aeronautical charges. (See Figure 4.)

**Figure 3: Aeronautical charge as share of average one-way fare (2015)**



Source: Milanamos PlanetOptim Future, Centre for Aviation

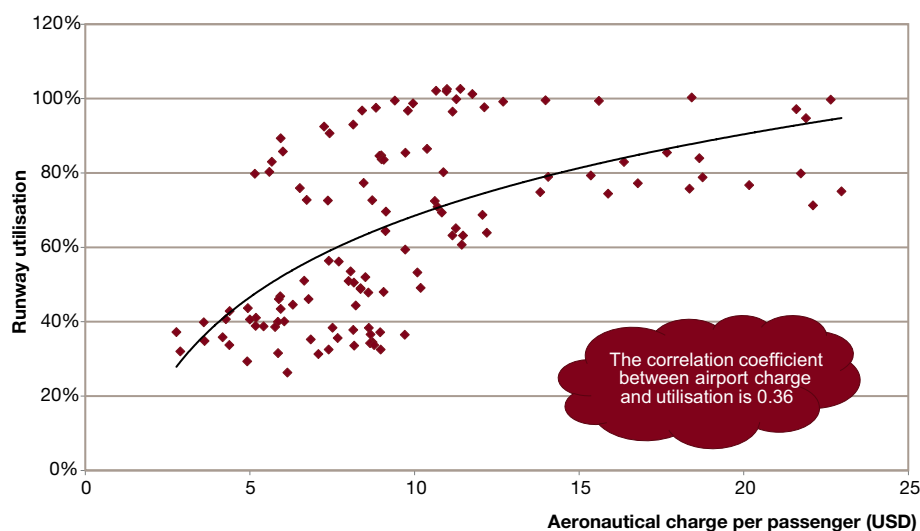
Notes: Average fare is based on one-way segment revenue and passengers for point-to-point passengers originating at each airport.

<sup>5</sup> Using a 'Contracts and commitments framework' where agreements are made between the airport and the airlines (where service level standards ['commitments'] are monitored), rather than a price cap set by the regulator.

<sup>6</sup> See for example: UK Department for Transport (2008), *Decision on the Regulatory Status of Stansted Airport*, pp. 11-12, <http://webarchive.nationalarchives.gov.uk/20081231144027/http://www.dft.gov.uk/consultations/archive/2007/consultstatusstansted/decisionstanstedairport.pdf>, and UK Department for Transport (2007), *Decision on the Regulatory Status of Manchester Airport*, p. 6, <http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/consultations/archive/2007/consultstatusmanchester/decisionmanchesterairport.pdf>.

<sup>7</sup> Source: Centre for Aviation (CAPA), 2013

**Figure 4: Runway utilisation (%) vs aeronautical charge per passenger**



Source: PwC analysis of airport annual reports and various sources for runway utilisation estimates

Note: A correlation coefficient of 0.36 indicates a clear trend/relationship originating at each airport.

Capacity constraints may also affect the fares that passengers pay for travel as constraints may put a limit on supply, which theoretically would increase prices. Where the supply of available seats is limited – be that through constraints on airline capacity or limitations on airport or airspace infrastructure – it is expected that the price paid, either by the passenger through air fares or the airline through airport charges, may be higher.

Given the many airport and airline specific factors that affect fares, we conducted an analysis on behalf of the UK Airports Commission<sup>8</sup> in 2013, which attempted to isolate the effect of capacity constraints on fares. We have updated this analysis to cover the period from 2004–2015. This study used ticketing data from Milanamos PlanetOptim Future for a selection of European airports<sup>9</sup> (both constrained<sup>10</sup> and unconstrained) and a variety of analytical techniques to examine the relationship. (See case study on page 33.)

<sup>8</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/372332/economic-analysis-consultants-reports.zip](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/372332/economic-analysis-consultants-reports.zip). ('PwC Fare Differentials')

<sup>9</sup> All airports with scheduled passenger services in France, Spain, Italy, Germany, Netherlands and the UK were included in the analysis.

<sup>10</sup> Constrained airports were defined as those operating at above 95% of their stated capacity in terms of air transport movements in any given year.



## Case Study – The impact of capacity constraints on air fares

### Hypothesis

Capacity constraints may affect the fares that passengers pay for travel. Where the supply of available seats is limited, be that through constraints on airline capacity or limitations on airport or airspace infrastructure, it is expected that the price paid, either by the passenger through air fares or the airline through airport charges, may be higher.

Given the many airport and airline specific factors which affect fares, we conducted an analysis to attempt to isolate the effect of capacity constraints on fares at European Airports (UK, Germany, France, Spain, Italy and the Netherlands) for the period of 2004 to 2015.

**H<sub>0</sub>: Capacity constraints lead to higher fares**

### Approach

As part of our approach to understand the impact of capacity constraints on air fares, we conducted two types of analyses:

- Trend analysis
- Detailed econometric analysis based on a panel data approach. This type of approach was selected given the nature of the data and its availability, e.g. limited time series, non-continuous data, wide variety of variables and use of dummy variables in the dataset. We conducted various tests to determine the best approach between Random Effect and Fixed Effect models. The Fixed Effect model was deemed as the most appropriate.

### Econometric analysis

**Model:** log-log model, capacity constraint dummy for all routes (excluding LCCs)

**Dependent variable:** Fare revenue per passenger mile, including tax (total, economy, premium)

**Independent variables:** capacity constraint dummy, frequency, number of airlines, seats per movements, route distance, segment passengers, GDP per capita for the origin country, GDP per capita for the destination country

#### Coefficient for capacity constraint

	Output
Total	0.228***
Short haul	0.162***
Long haul	0.154***

Significant at \*\*\* for 1%

### Variables

**Scheduled airline data** – seat capacity, frequency and seat miles by route, airline and year

**Airline ticketing data** – point-to-point passengers and average air fare by route, airline, class of travel and year

**Air passenger taxes** – air passenger taxes by country have also been considered in the analysis

**Aeronautical charges** – aeronautical charges have also been sourced based on the average aeronautical revenue of the origin and destination airport

**Other derived key indicators** – competing airlines on route; revenue per air passenger mile with and without taxes and charges for all classes, as well as for premium and economy classes; origin and destination airport size; seats per movement

**Economic indicators** – origin and destination country GDP per capita, crude oil prices

**Data sources:**

**Airline ticketing and schedule data:** Milanamos Planet Optim Future

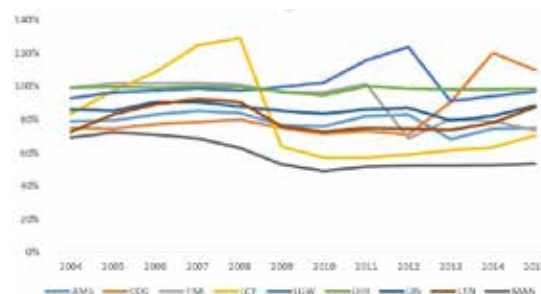
**Air passenger taxes** – IATA charges monitor

**Aero-charges and economic data** – various

### Trend analysis

As a first step we analysed trends to identify key drivers in air fares (e.g. route distance, competition, frequency, etc.) and the impact of airport capacity constraints. The trend analysis, however, did not provide any clear indication of the impact of constraints on air fares.

#### Capacity utilisation data for a sample of airports in Europe



### Results

We found evidence of higher fares being associated with airports with capacity constraints. Across all airports and routes included in the study, fare revenue per passenger mile was found to be circa **22%** higher for constrained airports relative to unconstrained airports.

The higher fare revenue per passenger mile observed at constrained airports might be the result of various factors, including the attractiveness of the destination served as well as the necessity by the airlines to cover higher airport charges and other operating costs.

## Conclusions

There is clear evidence that changes in aeronautical charges impact on airline network decisions; however, the level of impact varies from airport to airport depending on a range of factors such as market power, regulation, route network and airline customer base. We found that capacity constraints are associated with higher aeronautical charges and higher air fares – impacting on consumer benefits and demand. This usually results in the economic regulation of capacity constrained airports.

The structure of aeronautical charges need to be aligned with an airport's strategy and what they are trying to achieve in terms of services offered. Setting the level of charges requires a delicate balance to optimise revenues. If you reduce your charges too much, are you throwing away revenue? And if you increase them too much, are you throwing away growth? Identifying this 'sweet spot' is challenging. For example, the value in lowering charges may be disproportionate to the benefits in terms of overall financial performance. It needs to be considered that throughput drives non-aeronautical revenues; therefore, even if there is a net negative impact on aeronautical revenues as a result of reducing aeronautical charges and increasing demand, this may be offset by positive impact on non-aeronautical activities.

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# Has Brexit dampened airport valuations?

## The impact of the EU referendum vote on airport valuation

Romil Radia, PwC Middle East

Thomas Romberg, Constantinos Orphanides, PwC UK

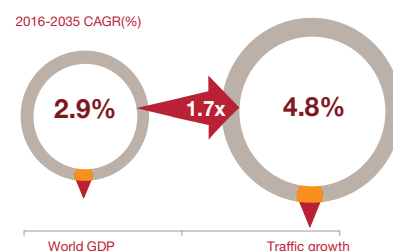
Airports deals are in the news again. London City Airport was sold for close to £2bn<sup>1</sup> (c.US\$2.8bn) while the French government partly privatised Nice and Lyon airports on a concession basis with potentially more French airport privatisations to come. At the same time, partial or full privatisation of other state-owned airports are expected to gain momentum in European countries such as Greece and Bulgaria. In the US, LaGuardia Gateway Partners was selected to design, build, maintain and operate LaGuardia Terminal B, a landmark US\$4bn project.<sup>2</sup> And there are proposals for potential airport privatisations in Canada as well.

Given current and imminent airport deals, it's not surprising that airport valuations are a very current topic.

### **Airports: A uniquely attractive asset class**

Airports are a uniquely appealing class of asset. That's because airports, while not immune to volume risk, typically offer fairly stable cash flows with the potential to realise significant capital appreciation on disposal. Indeed, the long-term outlook for air traffic volumes is positive, with growth forecast to outpace the increase in world GDP by a factor of 1.7. (See Figure 1.)

**Figure 1: World GDP and traffic growth**



Source: Boeing Current Market Outlook 2016 to 2035, PwC analysis

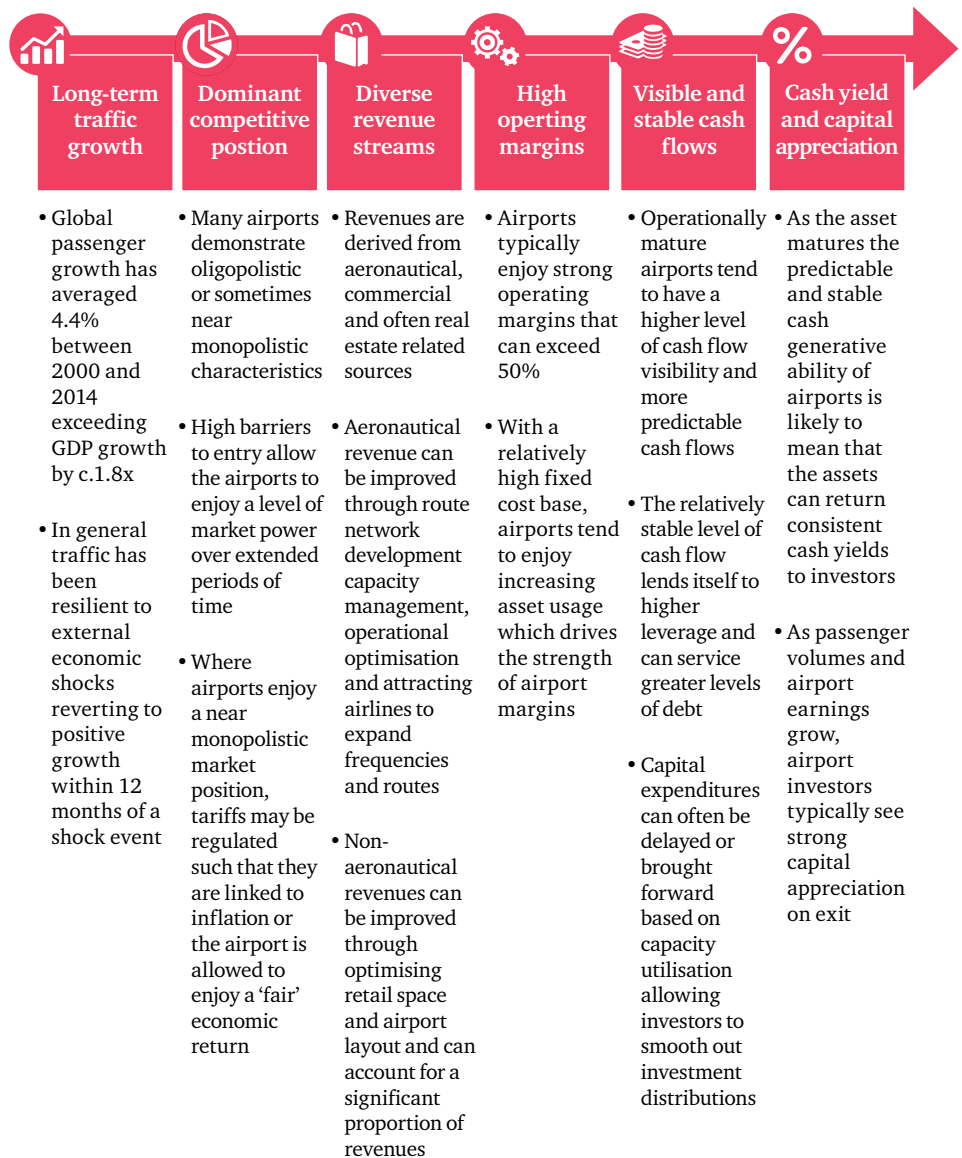
The strong traffic growth fundamentals are supported by relatively high operating margins many airports enjoy, thanks to high barriers to entry, relatively limited competition, and a level of traffic resilience. For mature and operational assets, these factors result in fairly predictable cash generation and a potential for the airports to deliver stable cash yields. (See Figure 2.) Even when air traffic falls during economic slowdowns, airports often are able to deliver growing dividends to investors through the deferral of operating costs and rescheduling or reducing of capital expenditure.

<sup>1</sup> Source: Financial Times, <https://www.ft.com/content/2d675756-dbe6-11e5-a72f-1e7744c66818>

<sup>2</sup> Source: LaGuardia Gateway Partners website, <http://laguardiagatewaypartners.com/project/>

Given current and imminent airport deals, it's not surprising that airport valuations are a very current topic.

Figure 2: Airport asset class characteristics



Source: PwC analysis

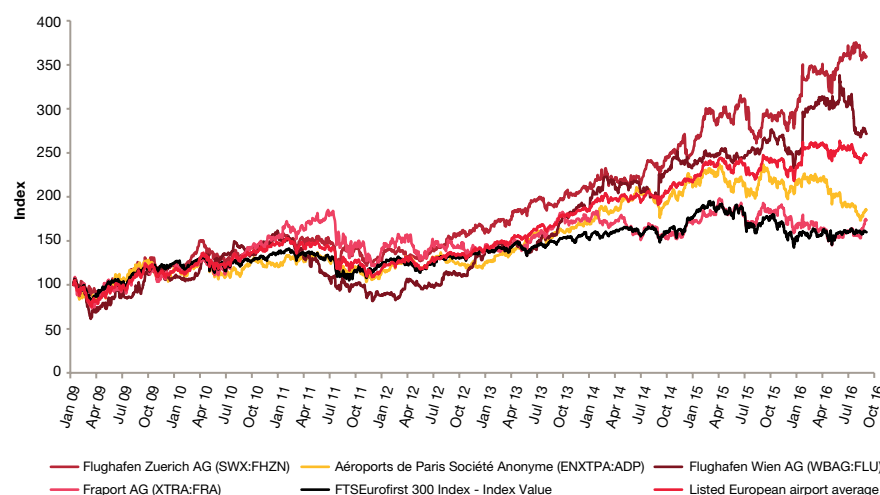
Indeed, listed European airports have on average outperformed the Eurofirst 300 index over the last seven years. (See Figure 3.)

### Today's airport investors

The airport deal space is occupied by a broad base of global investors. In today's low-yield, low-interest rate environment, we are seeing an increasingly diverse range of investors interested in the European airport deal space. These range from construction, engineering and airport operating companies to private equity, infrastructure, pension and sovereign wealth funds. Each type of investor brings a specific set of core competencies and competitive advantages to a deal, and is best positioned to invest in different stages of an airport's lifecycle.

For example, trade buyers (such as other airport operators) have strong experience in managing operating risk and implementing operational best practice. They are often best positioned to manage airports and improve operational efficiencies – by increasing commercial yields and expanding the airport's route network, for example.

**Figure 3: Listed European airport share price performance, 2009–2016**



Source: Capital IQ, PwC Analysis

The airport deal space is occupied by a broad base of global investors. Each type of investor brings a specific set of core competencies and competitive advantages to a deal, and is best positioned to invest in different stages of an airport's lifecycle.

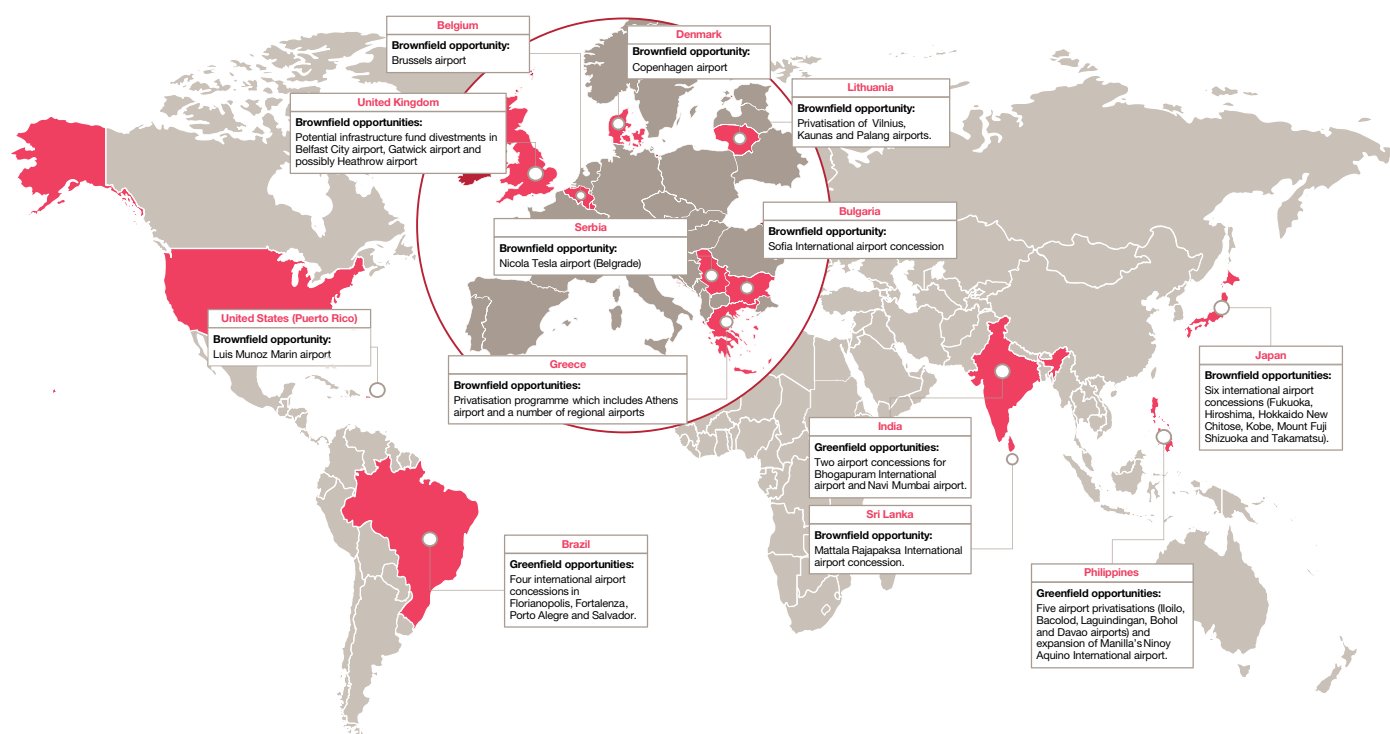
Construction companies have core competencies in managing construction risks and delivering large complex developments on time and within budget, giving them a competitive advantage in airport deals involving large capital outlays and in greenfield opportunities. Financial investors in airports, such as infrastructure or pension funds, are interested in the stable cash flows mature operating airports offer and often invest with their eye on the long term. Many focus on enhancing value by implementing optimal financing structures.

We are observing deal consortia comprising of an increasingly broad airport investor base with the aim of boosting value through operational and financial structuring improvements. Equally, we are seeing the European airport deal space being targeted by an increasingly international investor base, with active investors from Europe, North America, Asia and the Middle East in recent European airport transactions.





**Figure 4: Short-term airport pipeline opportunities**



Source: InfraNews, PwC analysis

## Deal pipeline

Airport assets expected to come to market over the next 12 months generally fall into two categories: government-led privatisation initiatives or infrastructure funds looking to monetise their airport investments as specific funds reach the end of their life. Financial investors – specifically, pension and sovereign wealth funds – tend to hold operationally mature airport investments for a longer term, reaping benefits from the relatively steady cash yield. This means that airports held by these investors rarely come to market but when they do they are highly sought after.

Looking at the pipeline of airport investments coming to market in the next year (see Figure 4) based on publicly available information, we observe that there are fairly few short term opportunities in European Organisation for Economic Co-operation and Development (OECD) countries.

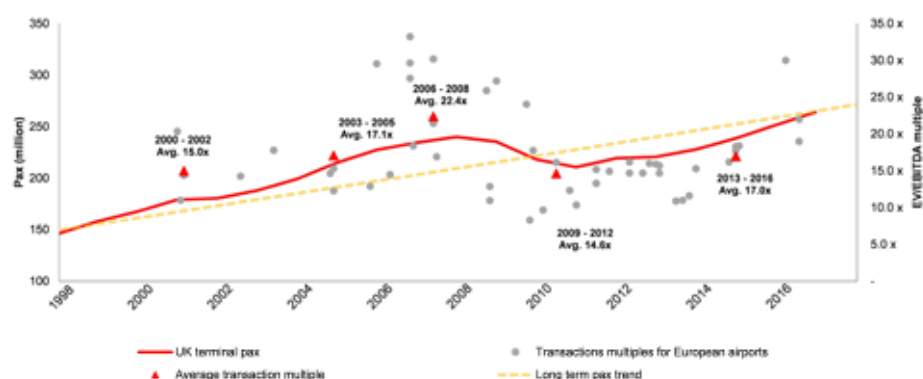
## Growth expectations and transactions

Actual UK passenger traffic alongside EV/EBITDA multiples<sup>3</sup> between 2000 and 2016 for European airports is shown in Figure 5. Whilst there are obvious challenges in comparing transaction multiples between airports due to each airport's specific operations and individual growth potential, it is fair to say that, on average, airport transaction multiples have been rising since the global financial crisis.

The combination of the current low-yield, low-interest rate environment, attractive asset class fundamentals, a broad international airport investor base, and relatively few airport investment opportunities coming to market have made recent airport deals highly competitive, with numerous consortia bidding for these assets. As a result, we have seen airport deals transacting at increased multiples, with the last three-year average multiple rising to around 17 times. This has also meant that, over time, winning consortia have had to accept a lower acquisition Internal Rate of Return (IRR) to secure the deal, with some of the most recent deals reportedly competing for high-single digit returns. Of course the reported returns for these deals must be assessed in the context of the bid case long term cash flows and the level of risk assumed in these.

Based on our assessment of the airport deal space above, we expect airports that have higher traffic growth expectations or strong competitive positioning to continue to transact within a multiple range of 15 to 20 times, and larger, more mature airports to transact within a multiple range of 11 to 14 times. However, there is nothing that precludes seeing higher multiples if there are asset specific reasons to justify it.

Figure 5: UK airport traffic and European transactions



Source: CAA, PwC analysis

While airport transactions clearly provide useful valuation benchmarks, it is imperative to undertake a comprehensive assessment of the comparability of transactions and make appropriate adjustments if it becomes apparent that they are incorporating different growth expectations, capex requirements or profitability levels. A comprehensive assessment of comparable transaction multiples is therefore required if these are being used as valuation benchmarks.

<sup>3</sup> Enterprise Value to earnings before interest tax depreciation and amortization (EV/EBITDA) multiples

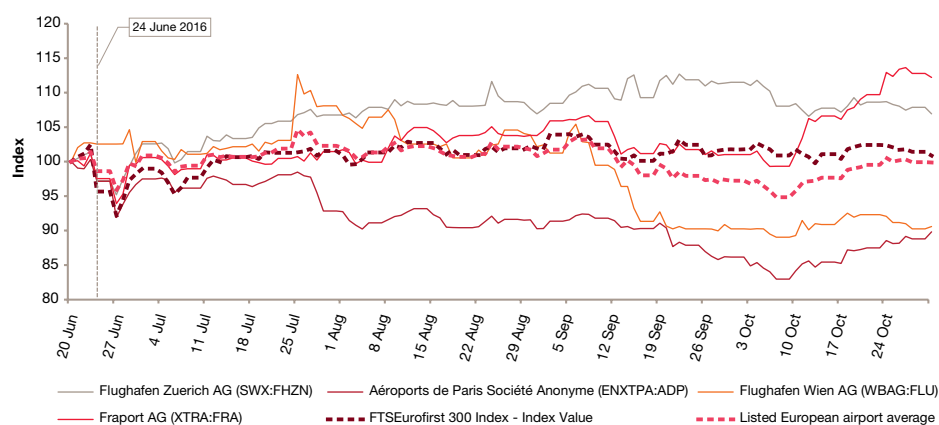
## UK aviation sector: What's the deal?

Brexit has undoubtedly raised concerns around the attractiveness of UK airports and European airports that rely heavily on UK routes; specifically, the impact on the airports' growth prospects and risk, and, by extension, value.

While short-term traffic in the UK post referendum vote has remained very resilient, certain carriers have signalled that they may slow down expansion in the UK, and there are emerging signs that some UK airlines are facing yield pressures. It is also the case that a large proportion of outbound leisure traffic will likely have been booked before the referendum vote and subsequent adverse pound sterling currency movements. Consequently it may be too early to assess any significant longer-term traffic trends resulting from the vote. Meanwhile, European-listed airports have moved broadly in line with the overall market since the referendum vote, suggesting no material value impact from the Brexit decision.

In the short term, any lower economic activity and post-Brexit uncertainty may lead to some reduction in UK passenger and freight traffic. In the event of a slowdown, discretionary outbound leisure demand is likely to be most affected, although higher inbound traffic (from a weakening pound) will also cushion any decline. Equally, the short-term depreciation of the sterling makes UK airport assets more attractive to global airport investors with a longer-term investment horizon; it may also stimulate regional export-oriented UK economies, resulting in a positive impact on traffic.

Figure 6: Listed European airport share price performance post Brexit vote

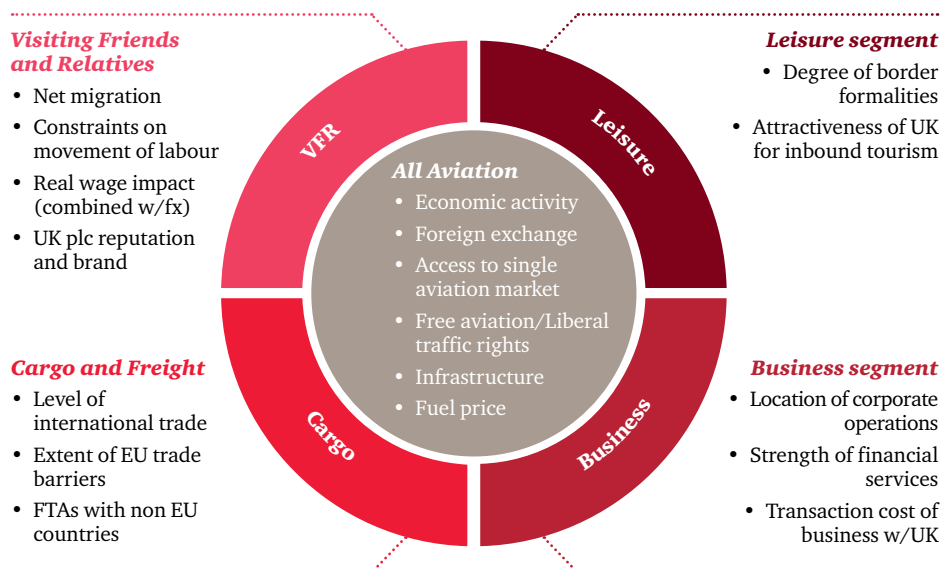


Source: CapitalIQ, PwC analysis

The longer-term direction of UK airport valuations will ultimately depend on the broader implications of the Brexit deal negotiated for the aviation sector, the speed at which it is concluded, and the impact of the Brexit deal on UK and European economic activity. At present, there is considerable uncertainty around the form this may take; however, some of the factors that will determine the outcome include the extent of access to a single aviation market, the direction of aviation market liberalisation and free trade agreements signed with non-EU countries. (See Figure 6.) In the event that airlines face increased regulatory costs to access the UK/EU markets or face higher US\$-denominated oil prices, these costs could in turn be passed on to passengers through higher air fares with a consequential impact on traffic demand.

Indeed, depending on the outcome of the Brexit deal negotiated for the aviation sector, there may be winner and loser airports within the UK. For example, UK airports with a higher proportion of outbound traffic and a route network with a higher exposure to European destinations will likely be impacted to a greater extent. UK route networks may shift focus to non-EU destinations, which could strengthen demand for long-haul travel, favouring larger UK airports with point-to-point routes/hub connectivity. More long-haul flights attract higher aeronautical charges and increase throughput, particularly for capacity constrained airports, while intra-EU Duty Free could be an important new revenue stream for both airports and airlines.

### Figure 7: Brexit impact on the aviation sector



Source: PwC analysis

## ***If you're thinking about investing...***

In the midst of post-referendum uncertainty one thing seems to have remained unchanged: UK and European airports continue to attract significant interest among airport investors, with strong expected demand for UK and European airports coming to market in the short term. Our key messages around airport valuations in the current post EU referendum vote environment are below:

In summary:

1. Overall, given the fundamental attractiveness of the airport asset class, the broad international nature of airport investors, long-term investment horizons of funds and opportunity pipeline, we expect European and UK airport multiples to be maintained at current levels in the short term, absent an economic slowdown.
2. Brexit may create winners and losers in the UK airport sector but the relative impact will depend on the Brexit aviation deal negotiated.
3. A broadening base of international airport investors are joining forces to deliver airport value enhancements – we are observing an increasing trend of construction, engineering and airport operators forming consortia with financial investors with the aim of delivering value enhancement through both operational and financial structuring improvements.
4. Cyclicalities should be built into long-term cash flow projections – when assessing the value of an airport, it is essential to recognise the cyclicalities of the industry, consider where we currently sit in the economic cycle and build sensitivities into cash flow projections to reflect economic downturns and other risks. One impact of the Brexit vote has been to increase uncertainty around future potential outcomes for the aviation sector, making sensitivity testing around possible post Brexit scenarios even more important.

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