

Connectivity and growth

Issues and challenges for airport investment

2015 edition

November 2015

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Introduction

Welcome to our latest edition of “Connectivity and growth”! This year, we see a strong pipeline of airport deals around the world, and there should be an overall positive outlook for the global aviation industry, thanks to low oil prices and an economic recovery that is building (albeit slowly). The aviation market appears to have turned a corner, with demand intensifying and airline profitability returning. But, there are also some dark clouds on the horizon, given that growth from emerging markets does not meet expectations.

Of course, the aviation market has always been cyclical – and many investors are concerned that current asset prices are nearing their previous peak and may be susceptible to correction if economic circumstances change. However, if fuel prices remain comparatively low and if the tide of demographic change in emerging markets continues, the long-term prognosis for airport assets is strong. This is especially true given the scarcity of assets available when compared to the demand from various investor categories.

In this year’s compendium, we have updated our analyses for all key themes as well as offered two new articles, one on the relationship between GDP growth and traffic growth and the other on converting

emerging market growth into investment opportunities. And we have maintained our focus on the most pressing issues affecting global aviation markets. The aviation sector does not operate in isolation; on the contrary, it is inextricably linked to globalisation, regional economic development, tourism, and national competitiveness. We take those links into account in all of our analyses.

Connectivity still receives significant attention this year, given that it lies at the heart of the value provided by the aviation sector to the broader economy, and is a measure of the health of an airport, a city, and a region. We make the case that new players will continue to enter the aviation infrastructure market, seeking to exploit regional opportunities to expand their interests and reap the advantages that connectivity brings.

As in previous years, we also explore the relationship between GDP growth and traffic growth, and find that the much-predicted delinking of GDP and traffic seems to have less of an effect than many observers assumed, particularly in more mature aviation markets. In addition, we revisit Asia as a focal point, looking at the challenges and opportunities that rapid aviation development continues to bring to the region.

Moreover, we explore how the airport transaction market and airport valuations have been affected as the aviation market aligns to new patterns of growth. Current high valuation estimates on some European airports coming to market suggest that our previous assumptions regarding airport valuation may merit re-examination. As the initial transactions from such markets as Japan and the Philippines emerge, we hope to be able to test and further strengthen our valuation and growth models.

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.

Yours truly,



Michael Burns
Partner, PwC UK

Planning for sustainable aviation growth

Dr Andrew Sentance

The global economic recovery remains uneven but there is a clearer pattern of growth now across the world economy. 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, world economic growth is expected to average 3.3% in the four years 2012-2015, slightly below the 3.5% long-term average since 1980.

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 that were present before the crisis are no longer supportive of growth.¹

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. These include

lack of labour market flexibility, high public spending and associated tax burdens, and a less business-friendly and business-like economic climate characterising the economies of North America and northern Europe.

Third, the major emerging market economies have seen more variable and uneven performance. China is the latest economy showing signs of slowdown, with independent estimates suggesting growth of 5% compared with official estimates still running around 7%. But the slowdown in China has been partly offset by stronger growth in India, which PwC now expects to grow by 7.5% this year. Outside Asia, though, a number of other large emerging market economies have been struggling. During 2012-2015, the IMF now projects that Brazil and Russia will both grow on average by just 0.4% a year. South Africa is not doing much better, with around 2% growth over the same period. A common feature of growth in Brazil, Russia, and South Africa is that it is heavily driven by energy and commodities, where global prices have been weakening since 2012. We have also seen political factors adversely affecting growth to some extent in all three of these economies recently.

¹ 'Rediscovering growth: After the crisis' – <http://londonpublishingpartnership.co.uk/rediscovering-growth-after-the-crisis/>

Connectivity is at the heart of what makes airlines successful.

But it is also possible to take a 'glass is half full' view of this global growth environment. As Figure 1 shows, there are three poles of growth in the world economy that appear to have survived and rebounded since the global financial crisis: the Asia-Pacific economies, North America, and northern and eastern Europe (including the UK). These three poles (including Japan and Australia within the Asia-Pacific region) account for nearly three-quarters of total world GDP. Sub-Saharan Africa is another dynamic region of the world economy, forecast to grow by nearly 4% in 2015 and close to 5% in the next five years. If Africa continues to perform well along with the other three major growth regions, we will have robust growth across 75-80% of the world economy in the second half of this decade.

This is an attractive prospect for the global aviation industry – and it is reflected in the investments and plans being made for expansion. Aircraft

orders remain strong, and new orders continue to outpace deliveries. The current order books for the major aircraft manufacturers imply a 50% increase in the commercial aircraft fleet over the next 7-10 years.

But we have been here before. When the world economy and the air travel market turns up, airlines pile in orders and then the next downturn exposes a major capacity glut. How do we avoid such a feast-and-famine outcome in the next 5-10 years? How should the major players in the aviation industry plan for sustainable growth?

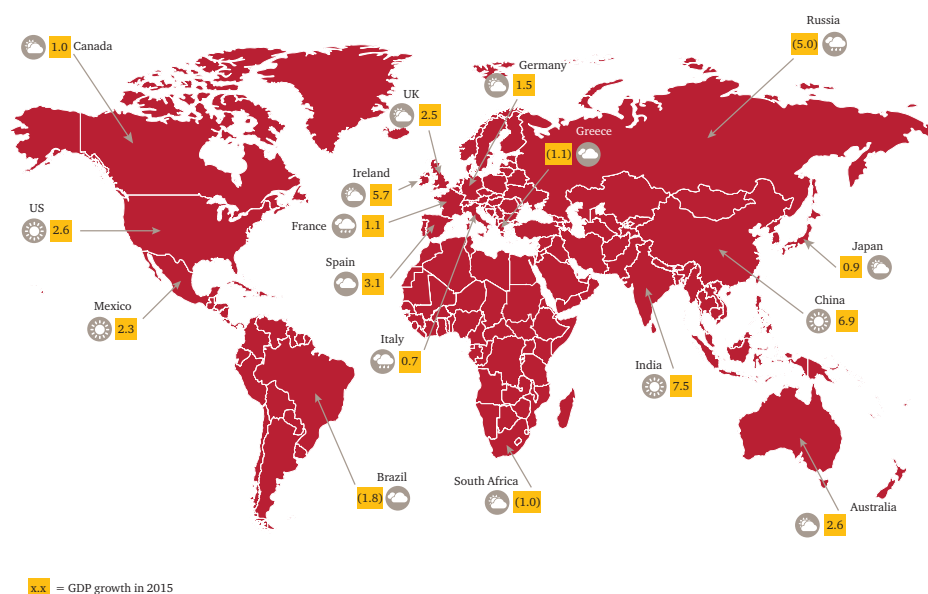
For airlines, the watchwords should be profitable growth, cost control, and connectivity. Growth opportunities need to be profitable. The airline industry has been a low margin one for too long, and the more successful modern airlines now recognise this. When I was Chief Economist at British Airways, we set ourselves a 10% operating margin target in the early

2000s, which compared with a 2-3% historical average for the industry prior to that date. Chasing volume growth supported by declining yields has bought 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. As new cities develop around the world – particularly in Africa, Asia, and other emerging markets – there will be many new route development opportunities.

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 lumpier, 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 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.

Figure 1: Global growth prospects for 2015



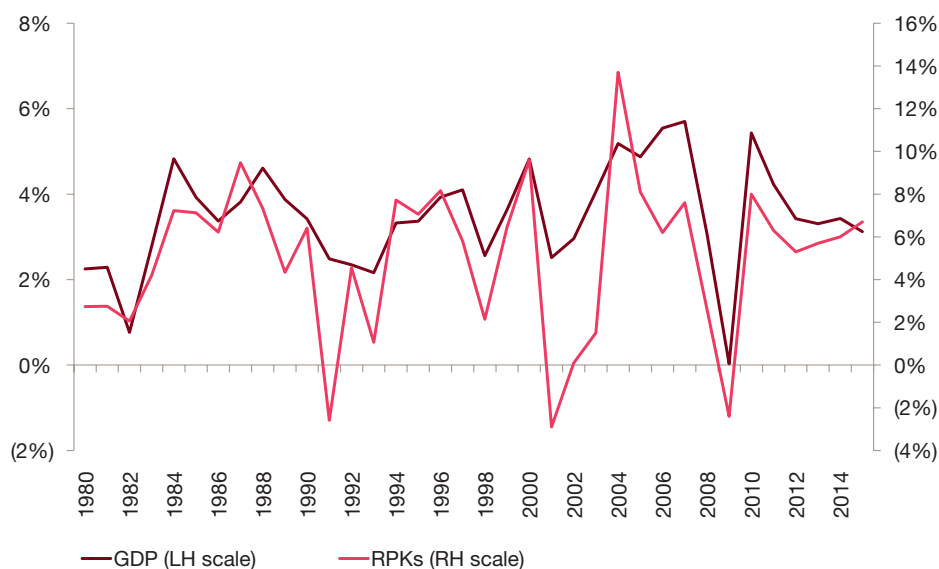
Source: PwC main scenario

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 that 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. At face value, the 50% increase in the commercial aircraft fleet represents a potential increase in aircraft noise, local air quality problems around airports, and greenhouse gas emissions. The aviation industry is dealing with all these issues – but the pace of technological change will not counter the adverse environmental impacts of future growth in all areas. A sustainable growth trajectory for the aviation industry therefore requires an acceleration of effort to address the environmental consequences of expansion – which will raise costs for the industry and air travellers over the longer term.

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

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



Source: IMF and ICAO/IATA

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. As Figure 2 shows, airline traffic rebounded more quickly after the financial crisis than it did in the early 2000s. Another reason why airlines have coped much better this time around is that there has been a process of industry consolidation in the more mature regions – US and Europe. At the same time, there have been significant growth opportunities in Asia, the Middle East, and Africa.

But as the industry shifts from survival to expansion mode, there are new issues emerging: the risk of over-expansion in airline capacity; the

difficulties of expanding airport and airspace capacity where it is most needed; and the long-term environmental challenges of a rapidly expanding global aviation industry. Looking ahead, these are the big challenges to the sustainable growth of the aviation industry.

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Airport transactions: Airport privatisation elevates deal activity to higher altitudes

Bernard Chow and Colin Smith

Your average airport investor is a pretty opportunistic, yet conservative sort: people rarely make investments in airports for short-term gain. Consequently, despite the shoots of economic recovery only starting to show in 2013 and 2014, airport investors were ahead of the curve – seeing transactions rocket from a low point of US\$3.5 billion in deals in 2008 to about US\$21 billion in 2012 and US\$18 billion in 2013. Airport transactions have subsequently slowed to US\$6.3 billion in 2014 with a pick up in the first half of 2015 to US\$3.1 billion. (See Figure 1.) The slowdown reflects primarily delays in privatisation of airports in Greece and Southeast Asia.

On top of investor foresight, governments have finally come to grips with the requirements of privatisation deals, with assets sold in Portugal, Spain, Brazil, North America, and Turkey, and with Japan, Greece, and France launching processes. We expect this trend to continue, with 22 countries currently looking to concession at least 40 assets.

Whilst deal activity has risen significantly, optimism in the investor base has not followed suit. Values have risen much more cautiously, with average deal multiples in UK/Europe recovering a little, but not reaching the heady pre-crisis heights. Some recent deals suggest that the competition for assets may be starting to intensify, particularly for attractive assets, which may drive deal multiples upwards – we will continue to watch developments with interest.

Peaks in deal activity

The airports industry has been a hive of deal activity between 2012 and 2013, with number of deals reaching a peak of 20 in the second half of 2013, generating deal value of US\$13 billion. Deal volumes and value have since fallen in 2014 to US\$6.3 billion and 16 deals, which reflects a gentle breather before a further wave of airport privatisations in Japan and France, as well as airport exits in UK/Europe. As mentioned earlier however, the delays in some privatisation programmes may impact how quickly airport deal activity takes off again.

Airport deal activity has historically been driven largely by European transactions, particularly in the UK, which has by far the most developed private marketplace for airport assets. In the first half of 2011, UK/Europe airport deals accounted for 83% of deal volume.

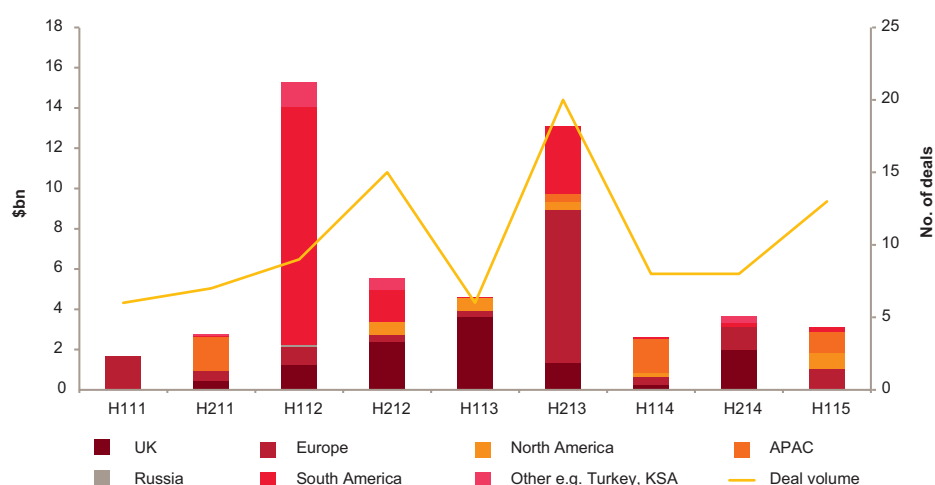
However, the UK market is becoming saturated (and stunted to a certain extent by its inability to decide on the location of new runway capacity). As a result, investors have cast their nets further afield, with fund managers looking for opportunities to invest in growth; direct investors focusing on more stable, reliable assets; and strategic buyers focusing on assets that complement existing portfolios.

The first half of 2012 saw the first real emerging market activity, with Brazil leading the charge (the US\$9.5 billion Guarulhos International Airport and US\$2.2 billion Viracopos International Airport privatisations). The UK and Europe responded in kind, taking a 70% share of deal activity in the second half of 2012 and first half of 2013. Notable European deals in that period were the ANA privatisation (US\$4.1 billion) and Heathrow finally saying goodbye to Stansted (US\$2.3 billion), whilst Manchester Airport Group sold a stake in itself to fund the Stansted acquisition (US\$1.4 billion). Together with Ferrovial's sale of chunks in Heathrow 4 to pension and sovereign wealth funds (US\$1.5 billion) and Hochtief's eventual disposal of its airports division (US\$1.5 billion), the glut in European activity over the 12-month period was compounded.

Privatisations

South America has been the main region for airport privatisations since January 2012, accounting for US\$16 billion of the US\$20 billion globally from January 2012 to December 2014. In Brazil, five airport concessions were awarded in Sao Paulo, Rio Grande do Norte, Distrito Federal, and Belo Horizonte. Colombia and Panama also saw airport privatisations. Outside of South America, the main privatisations were in Saudi Arabia, Turkey, Puerto Rico, and Croatia.

Figure 1: Global airport deals by region



Source: Infranews, PwC analysis

Notable in its absence was the anticipated liberation of US airports from government and state control. Only Puerto Rico managed to get off the ground, with Chicago Midway again falling by the wayside. Going forward in the US, a terminal concession-based model appears more likely than full airport privatisations, which may limit interest from mainstream airport investors.

Stable growth in valuations

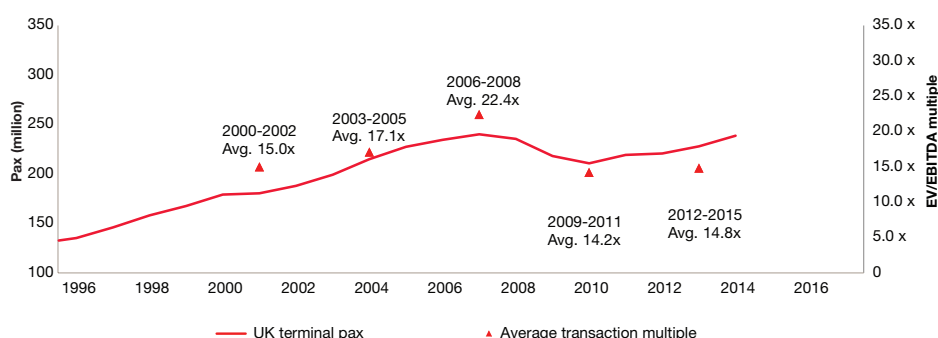
Despite market conditions appearing to set the stage for a valuation bubble, evidence suggests that investor caution has prevailed for most assets, albeit with some exceptions.

As explored in our airport valuations review later in this document, average deal multiples have increased – particularly in Europe – with EBITDA multiples of 14-18 for faster growth regional airports and 10-14 for mature, larger airports.

The trendline suggests that valuations are unlikely to see a rapid, sustained return to the heady heights of 2006-2008, when multiples of 20-plus were not uncommon. (See Figure 2.) That said, some emerging market deals are bucking the trend, with investors banking on strong growth from new airports with untapped commercial potential.

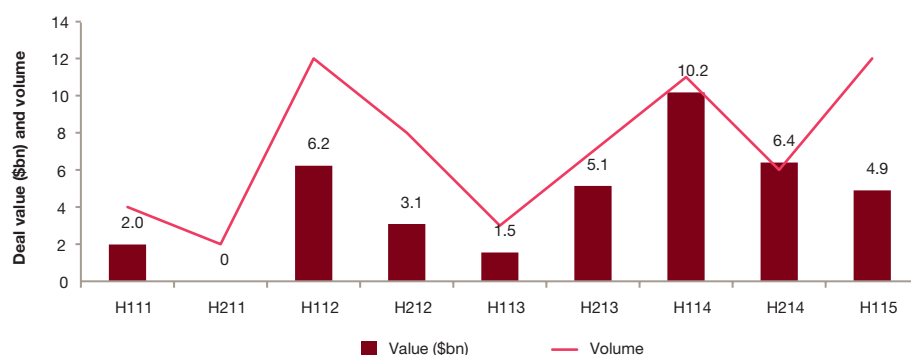
Refinancing activity – Alongside a return of airport deals, we also note a resurgence in refinancing activity, largely to replace acquisition debt raised pre-crisis, as airport owners take advantage of improved trading conditions driven by recovery in air travel and increased availability of debt financing. (See Figure 3.)

Figure 2: UK airport traffic and European transactions



Source: CAA, DfT, PwC analysis, Press

Figure 3: Global refinancing activity



Source: Infranews, PwC analysis

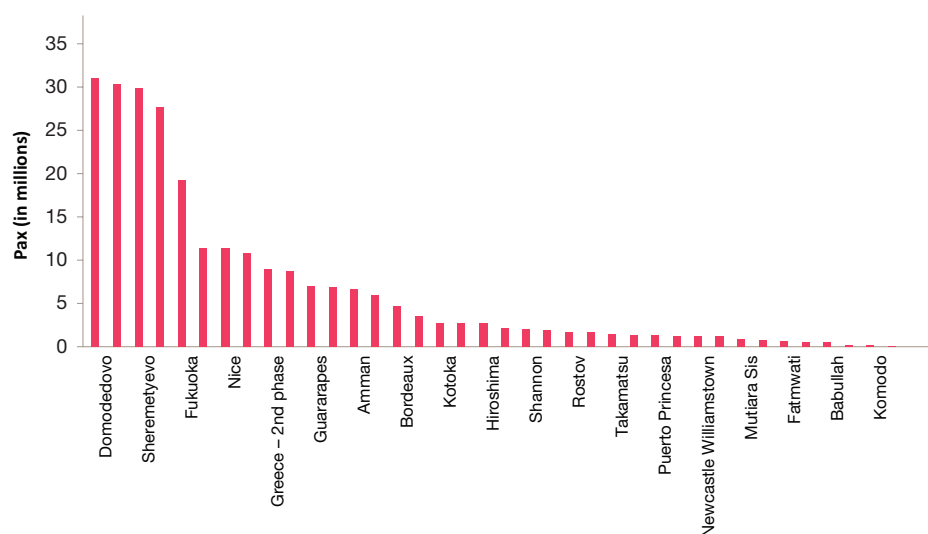
The investor landscape

As highlighted earlier, we expect privatisation activity to continue growing apace, as airport sales remain attractive to governments seeking to realise cash through asset sales. Airport privatisations also serve as a strong mechanism to encourage investment and stimulate economic growth. (See Figure 4.)

Greece, France, Japan, Brazil, and Ireland have all announced separate privatisation drives between 2014 and 2016. This is likely to be pushed out further to 2017 as privatisations have not progressed as quickly as first hoped. In Europe, the first wave of Greek and French regional airports received investor bids in September/October 2014. However, the Greek regional airport transaction is yet to be completed following ongoing negotiations between the new government and the preferred investors.

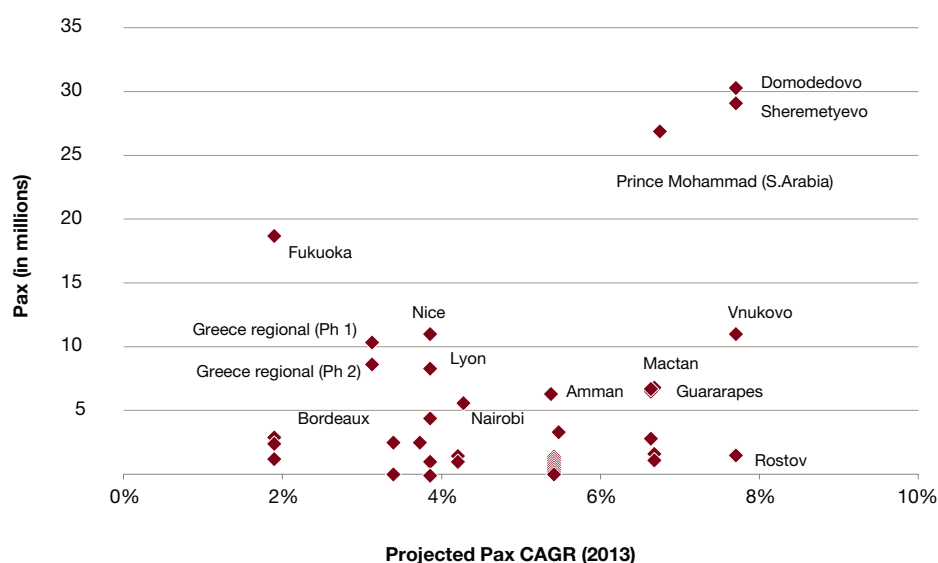
The Japanese Ministry of Transport meanwhile highlighted four airports for its first wave of privatisations, starting with Sendai Airport and followed by New Kansai, its third largest airport, and Osaka. As of the date of this article, the Sendai Airport concession was awarded to a Tokyo Corp led consortium while Vinci Airports and Orix Corporate consortium are the front runners for the New Kansai airport. The government is looking to concession two further airports between 2016 and 2019, followed by a further 16 airports. (See Figure 5.)

Figure 4: Global pipeline airport privatisations



Source: Various news sources, PwC analysis

Figure 5: Global pipeline airport privatisations – current and projected pax growth rates



Source: IATA Country forecast, PwC analysis

Note: Projected pax growth is based on IATA's forecasts for the country rather than the airport specifically.

Other opportunities

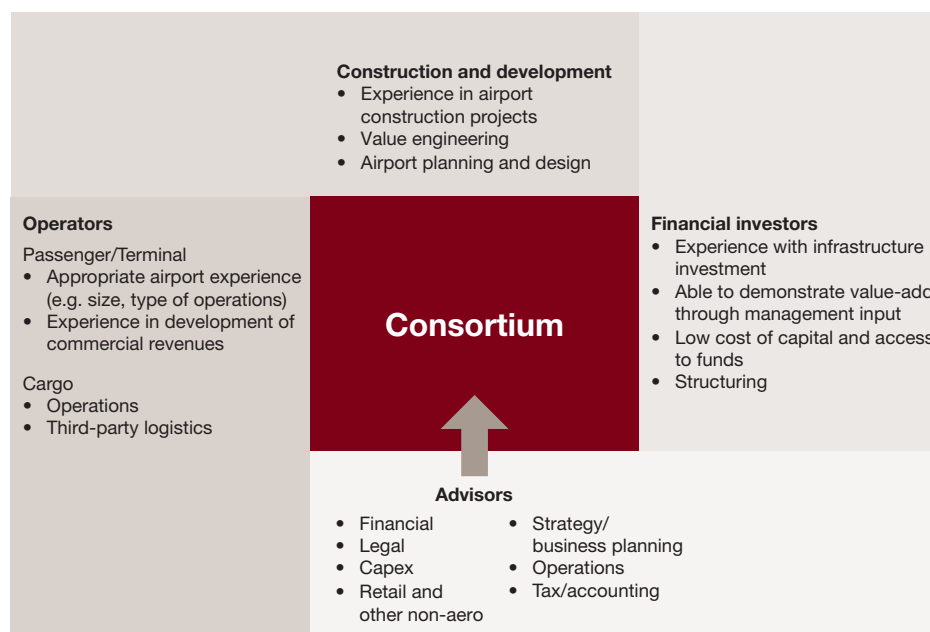
Notwithstanding the fact that airport privatisations are likely to dominate the headlines and deal activity, airport investors' interests should remain piqued by private investment activity. In the UK alone, London Gatwick, London City, Bournemouth, Doncaster, and Leeds Bradford airports are all expected to see transaction activity over the foreseeable future, kicking off with London City, with bids due before Christmas 2015. With closed-ended infrastructure funds looking to realise value, deal volumes should stay healthy, although the proliferation of off-market deals looks set to continue. Recent examples include Ferrovial's concurrent stake sales in Heathrow and its and Macquarie's acquisition of Heathrow's regional airports (Aberdeen, Southampton, and Glasgow) and Ontario Teachers' pre-emptive acquisition of Macquarie's stake in Bristol airport.

How has the investor market changed?

With an established infrastructure investor base ranging from private funds and publicly listed vehicles to major municipal pension funds and trading houses, airport investments have unsurprisingly also become more specialised.

Major capital-city airports will attract no shortage of pension fund and sovereign wealth bidders, whilst smaller and regional airports will attract investors who believe they can help management teams execute ambitious business plans and drive value through improved performance throughout the business.

Figure 6: Building a strong consortium



On privatisations, credible consortiums are the key to success, as governments look for a combination of price and trusted airport operators. (See Figure 6.) However, coming together to execute a successful acquisition is the easy part: aligning ongoing interests between financial investors and operating parties will prove more challenging, as will giving management a clear view of the post-acquisition business plan.

Final thoughts

With no shortage of airport opportunities ahead, the market rightfully seems an attractive one to infrastructure investors, who continue to attend industry conferences in numbers.

With economic turbulence subsiding but not disappearing altogether, airport investors would be wise, however, to exercise a degree of restraint. The recent economic downturn made it abundantly clear

that airports are not homogeneous assets, and not all are worth investing in, unless the price is right.

In particular, smaller and regional airports have a habit of developing winners and losers, and getting the right team on board to execute a transaction is likely to maximise chances of on-deal and post-deal success.

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Is GDP growth still a reliable indicator for future air travel demand?

Edmond Lee, Andrew Copeland, and Hayley Morphet

Global air passenger traffic has grown substantially (70%) in the past decade.¹ Innovations in the aviation market, such as greater airspace liberalisation in the developed economies and the increasing prominence of low-cost carriers (LCCs) in intra-regional routes, have helped spur this growth. Propensity to fly has also been positively driven by global economic growth; in particular, rising incomes in the emerging markets.

Air traffic demand growth is more impressive in the last decade, given that it has been characterised by structural challenges and economic volatility. The 2008 financial crisis and the ensuing recession has also set passenger demand back temporarily. In Europe and China, airlines face increasing competition from high-speed railways over short distances.

In the same period global GDP has grown by 28%² in real terms. A high proportion of this growth has been driven by the developing economies. This has been associated with a swelling of their middle class, along with higher demand for both business and leisure flights, contributing to the increase in global air traffic flow.

Historically, as the global economy grows, people and businesses tend to have more disposable income that could be spent on flights, to facilitate their leisure plans or business activities. On top of this, the increased connectivity between regions that were not before connected as well as domestic connectivity – which has proved increasingly important as people's time has become more valuable – have helped push up global air traffic demand.

For investors and stakeholders, it is important to understand what lies ahead for the consideration of both opportunity and remediation in the aviation industry. Investment opportunities with strong growth prospects require an understanding of trends in the forces that ultimately affect revenue growth.

This article aims to shed some light on whether there has been a breakdown in the relationship between GDP and air passenger demand and attempts to highlight any variables pulling the two apart. We employ econometric and forecasting techniques coupled with our industry expertise to evaluate the hypothesis of a weakening relationship.

¹ Increase from 2004 to 2014 based on World Development Indicators data (Worldbank) for world air passengers carried.

² Increase from 2004 to 2014 based on World Development Indicators data (Worldbank) for world GDP (constant 2005 US\$).

The GDP-air passenger demand relationship

It is widely appreciated that GDP and air traffic demand have, historically, exhibited a strong positive relationship; increases in GDP were associated with increases in passenger traffic and vice versa. As such, GDP growth has been used as a key explanatory variable in forecasting future air travel flows in numerous studies in government, industry, and academia.

However, over the past number of years there has been some debate around this relationship and a question of whether it is still as relevant as it once was. Most notably, the 2008 financial crisis appears to have caused a structural break in the series, distorting the once clear relationship.

There is some previous literature that robustly illustrates the relationship between economic growth and air traffic demand. Studies have focussed on two main aspects of the relationship. The first is causality; that is, do changes in GDP cause changes in air traffic, or do changes in air traffic cause changes in GDP. From a theoretical standpoint, arguments for either case are plausible. The second aspect is the degree to which one factor affects the other.

Mukkala and Tervo (2012) have shown that there exists a relationship between air traffic and economic growth based on analysis of the European market. Similar conclusions have been reached by a number of other studies providing substantive evidence that there is, at the very least, a positive link between GDP and air passenger flow. However, while some studies such as Ishutkina and Hansman (2009) found evidence that supports a two-way causality, some others (e.g. Green 2007) have been seemingly stumped by the direction of causality.

This article aims to bring new ideas to the table, particularly around variability in strength of the correlation.

A view from the UK: an econometric case study

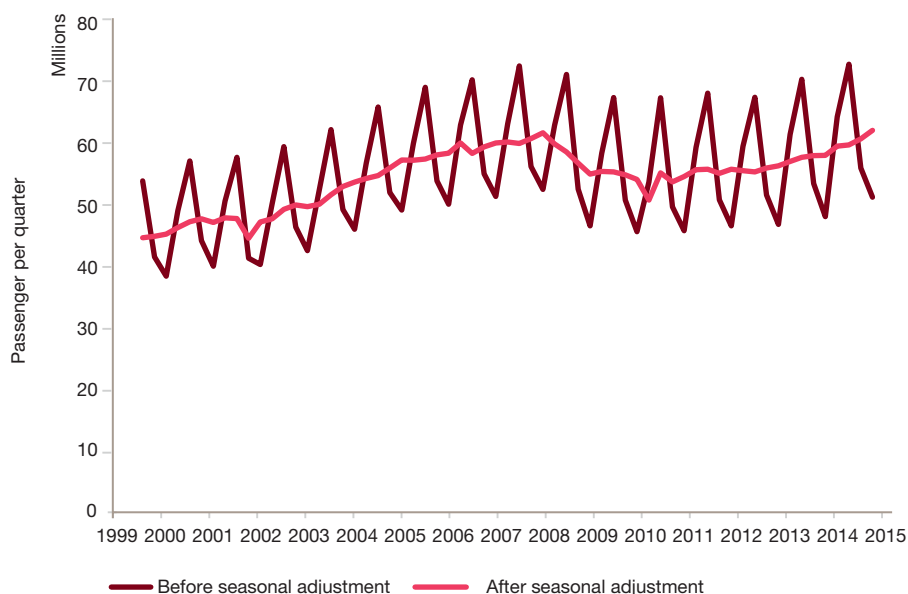
We start our analysis with a case study of the link between national income and air travel in the UK. The Civil Aviation Authority (CAA) maintains a detailed monthly database of number of passengers passing through UK airports. National income can be measured by GDP, which is available quarterly.

In this case study, we will first explain the methodology we have used, and what it reveals with regards to the GDP-passenger demand relationship. We will also forecast how UK passenger demand may evolve in the near future. Finally, we will have a closer look at how the number of

passengers using the three largest airports in London had reacted to changes in GDP.

Both GDP and air passenger traffic are known to be seasonal; that is, they exhibit certain cyclical behaviours over the year. For example, air traffic is significantly busier in the summer months as there is more demand for leisure travellers. 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 U.S. Census Bureau. We may also de-trend the GDP and air passenger time series and focus on how they move together. In Figure 1 below, we present the time series of air traffic in UK airports before and after seasonal adjustment.

Figure 1: UK air passenger traffic before and after seasonal adjustment, 1999Q3 – 2015Q1



Source: CAA, PwC analysis

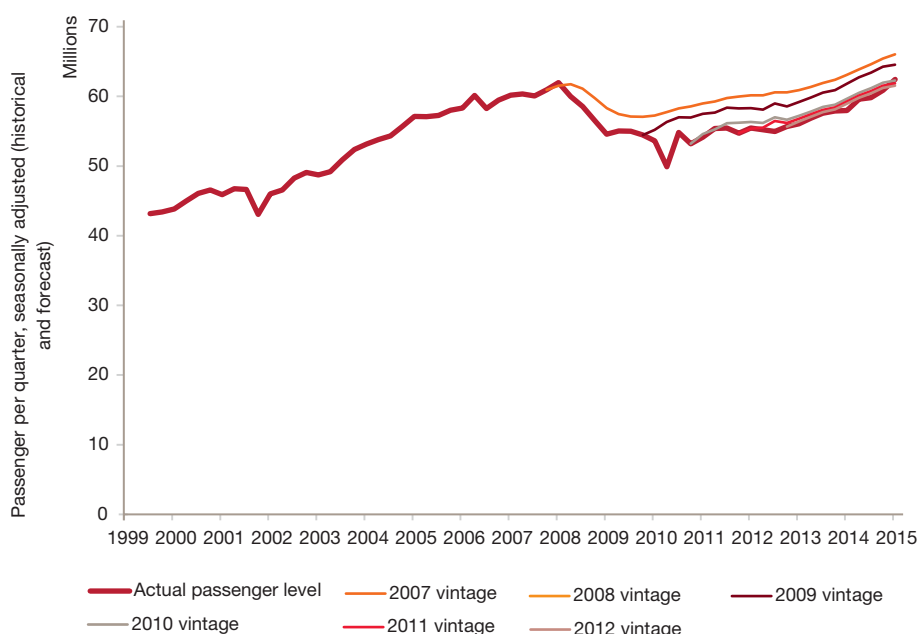
We could then apply an Error Correction Model (ECM) to the adjusted time series. The ECM approach allows us to disentangle two distinct relationships from the data: on one hand, it estimates (i) **the long-run relationship** between GDP and air traffic; on the other, it also allows for (ii) **short-term 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 models, 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. However, we also found a one-off downward level shift in the wake of the 2008 global financial crisis. Figure 2 shows the central case of 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 vintage’ forecast, we applied our methodology on data up to the end of 2006. We then made projections for passenger level based on the estimated parameters and actual GDP that has materialised.

We found that over the last five years, the actual passenger level has been consistently below the forecasts of 2007 and 2008 vintage by around 4-5 million people per quarter. On the other hand, actual passenger level broadly followed the 2010, 2011, and 2012 vintages of our model forecasts. This suggests that while the passenger-GDP relationship held out well for most of the period we studied, it is likely that a one-off shift in the trend has taken place after 2008.

There are various reasons why this has been the case. For example, it is plausible that 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 shed more light.

Figure 2: Backtesting the model: what if we applied our methodology in the past?



Source: CAA, PwC analysis

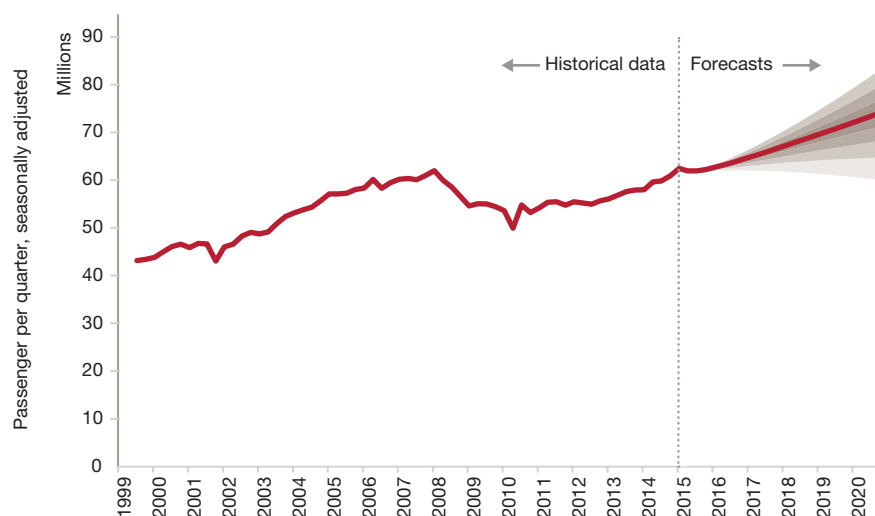
Note: The thick burgundy line represents the actual quarterly passenger level, seasonally adjusted. The thinner lines represent the central scenario of different ‘vintages’ of forecasts we would have obtained if we had carried out the analysis at the beginning of each year between 2007 and 2012.

In Figure 3, we applied our methodology to forecast UK passenger number between mid-2015 and the end of 2020, based on GDP forecasts from the UK Office for Budget Responsibility (OBR). Our median case, shown in a dark solid line, suggests that the air passenger level would increase year-on-year by around 3.3% – slightly above the 2.7% year-on-year growth that IATA forecast the UK to achieve. Uncertainty around our forecasts would increase as we move deeper into the future. To reflect this, we also present the margins of error of our central estimates with different shades of orange in Figure 3.

We then turn to the passenger levels in individual airports and their relationship to GDP of the whole UK. Figure 4 shows the extent that passenger levels in three major London airports have, over the long run, reacted to changes in the UK's GDP. We found that Heathrow, London's principal international airport where most long-haul flights are based, has been most resilient to fluctuations in GDP, followed by Gatwick, the second busiest airport of the UK. On the contrary, passenger level at Stansted, an airport dominated by low-cost carriers, is significantly more responsive to the economic cycle.

There are two plausible explanations behind this. Firstly, Stansted is dominated by low-cost carriers. They have a higher proportion of leisure passengers, who are more sensitive to fluctuations in the business cycle. Secondly, when demand for air transport decreases during an economic downturn, it might not necessarily affect all airports equally. The airline industry may choose to absorb the decrease in demand by cutting capacity in a less preferred airport without coordination: for example, the full-service carriers may scale back their Gatwick operations that started as Heathrow overspill. These slots may then be taken up by

Figure 3: Forecasting UK airports' passenger level



Source: CAA, PwC analysis

Note: The fan around the central estimate is calculated with GDP growth forecasts from the UK Office for Budget Responsibility (OBR), which set out their view on the UK economy under optimistic and pessimistic cases.

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 is most affected by an economic downturn.

Further considerations

While we feel our analysis provides some interesting and relevant insights into the GDP-air traffic demand relationship, it should not be considered exhaustive. While we have 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'. As the budget airline market has become more mature, we may expect air fares to take a more stable path in the near future, resulting in a gentler growth path for air traffic.

We have to some extent touched on the effect that crises can have on traffic growth; our analysis shows a clear downward shift following the 2008 financial crisis. Other crises such as the Ebola outbreak and war can have the same effect. It may not be surprising that Syria experienced a decline of 30% per year in air traffic during 2010-2014, a result of ongoing tensions in the country.

Demography can also have a notable impact on air traffic demand. At the most basic level, increases in population could increase air travel by raising airport catchment area populations and generating more trips. This is definitely a space worth watching in the UK, especially given recent migration issues around the EU and Syrian refugees.

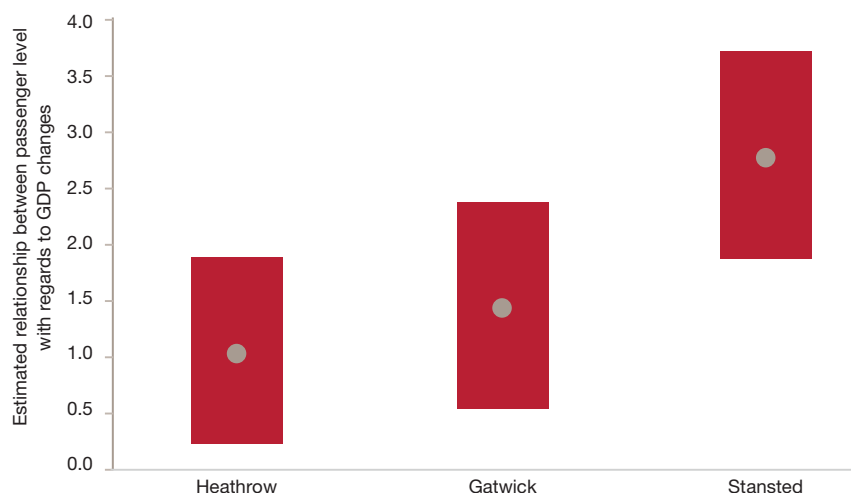
Market maturity is another important factor. In effect, this describes the fact that markets tend to reach saturation points in terms of trips per capita. The marginal effect of a growing economy on propensity to fly diminishes as the market matures and approaches saturation.

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; from this 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.

In the past decade or so, competition has had a huge impact on shaping the aviation market. The increase in LCCs has accounted for a significant portion of the increasing air traffic demand globally. However, when considering the case of the UK, LCCs' impact looks to have diminished. 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.

A final consideration is that of the hub status of an airport. Hubs such as 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).

Figure 4: Estimated relationship between passenger growth and GDP growth



Source: PwC analysis

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

Conclusion

In this short study, we have examined what drives global air traffic growth, focussing on what is arguably the most important factor, economic growth. From our analysis, it is clear that economic growth in the UK greatly influences the underlying sentiment of air traffic growth in the country. Additionally, we have directed attention to the apparent breakdown in the relationship between GDP and passenger growth and alluded to the heterogeneity in airports; that is, no one single airport can be viewed in the same light as another, even within a country such as the UK where airports in London all face their own challenges. This illustrates the potential magnitude of variances across global air traffic drivers. We also subsequently highlighted some of the other key issues that should be seriously considered when analysing an airport as an investment opportunity, such as competition, air fares and demography.

Having studied in some detail some of the dynamics of UK aviation growth, we concluded that while the 2008 financial crisis appears to have caused a structural break in the series, the GDP-passenger relationship still bears some significance in practice. Ideally, similar analysis may be carried out on a wider range of countries with inclusion of additional variables mentioned to further strengthen understanding of the dynamics and drivers of the aviation market. However, the analysis on a mature market such as the UK gives us a flavour of the sort of trends investors and other stakeholders should be paying attention to in the coming years.

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Converting emerging market growth into investment opportunities

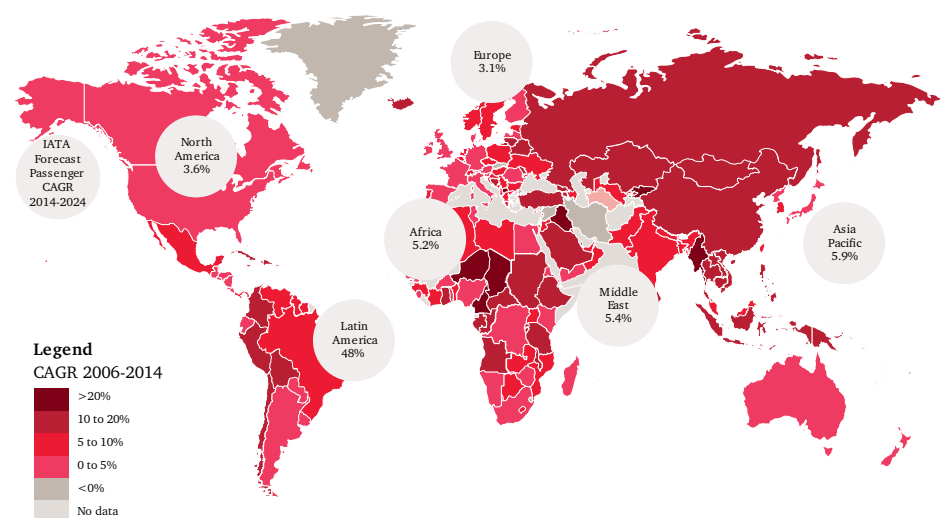
Hayley Morphet and Andrew Copeland

Identifying investment opportunities with strong growth prospects requires an understanding of trends in the forces affecting revenue growth. For airport infrastructure this is driven primarily by passenger growth. Globally around 500 commercial airports have some form of private-sector participation,¹ and many of these are larger airports in mature markets such as Europe and Australasia. Investors have traditionally formed their analysis on developed markets when crafting their infrastructure investment strategies; however, more recently there has been increasing interest in emerging markets.

Many growth opportunities lie in the emerging economies where the aviation market is still very much developing. However, significant passenger growth does not always convert into opportunities for investors. This article aims to explore some of the opportunities and challenges to investors looking into emerging markets and identify where the most promising investment opportunities may lie in the future.

Figure 1 summarises global air traffic growth in the past eight years and forecasted passenger growth for the next decade.

Figure 1: Historical and forecast growth in each region of the world



Source: IATA 20-year passenger forecast, PwC analysis

¹ Centre for Aviation, "CAPA Airport Finance and Privatisation Review 2014/15".

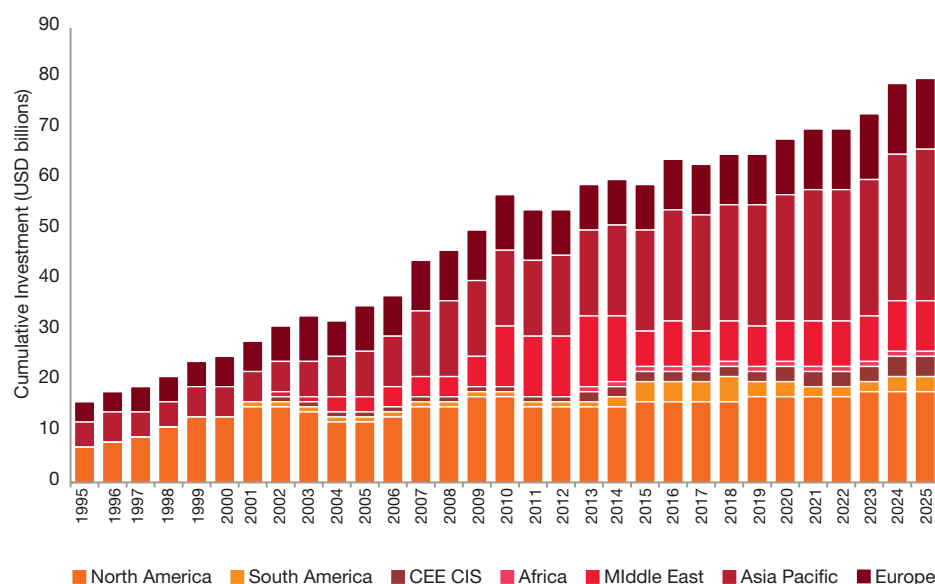
Asia-Pacific has experienced high levels of growth in the past decade. China's passenger traffic, for example, grew at a remarkable 10.3% per year while Indonesia grew at an even greater 11.3% per year since 2006. However, these sky-high growth rates are not expected to continue; the next decade is forecast to bring about more modest growth. The Asia-Pacific region is looking at a growth rate of 5.9% per year over the next decade. This is reflected in both China and Indonesia's forecasts, with China looking at a 6.9% annual growth rate while Indonesia's growth is expected to be around 4.8% per year.

The Middle East has also seen huge passenger growth in the past decade of 8.7%, aided by its central location on the globe and the increasing prominence of hub airlines and airports. Its outlook remains optimistic, although slightly diminished, with expected annual growth of 5.4%.

Africa and Latin America are expected to show strong growth with passenger forecasts of 5.2% and 4.8% per annum, respectively, over the next decade.

Mature markets such as North America and Europe are expected to see more modest growth of 3.1% and 3.6% per annum respectively, with Europe's growth bolstered by stronger growth in Eastern Europe.

Figure 2: Estimated annual investment in airports by region



Source: PwC and Oxford Economics

Note: USD million, current prices, constant 2014 exchange rates

Capital Investment in Airport Infrastructure

In the coming decade there is a vast amount of planned capital investment in airport-related infrastructure, with global growth in airport investment estimated at 2.6% per annum. This amounts to a cumulative investment of US\$750 billion between 2015 and 2025. Figure 2 shows the estimated annual level of investment in airports by region based on a study conducted by PwC and Oxford Economics.²

Despite passenger growth in the Asia-Pacific region being more modest than has been observed in recent years, the need for significant infrastructure investment remains in order to facilitate current and future demand. The Asia-Pacific region is expected to see the highest level of investment in airport infrastructure in the coming decade, with an estimated cumulative investment of US\$275 billion. It is anticipated that China will

account for over half of this, with expectations that it will invest over US\$150 billion from 2015 to 2025. Indonesia, a country where airport infrastructure spend has picked up strongly in the last few years, is expecting to see expenditure of around US\$25 billion over the next decade.

Central and Eastern Europe and the Commonwealth of Independent States (CEE CIS) is primed to burst with infrastructure investment this coming decade, similar to what was seen in China in the previous decade. It is expecting annual growth of 8.1% in infrastructure investment during 2015-2025, amounting to cumulative spend of US\$30 billion.

The level of airport infrastructure investment in the Middle East is estimated at US\$94 billion over the next decade compared with US\$84 billion in the last decade.

² PwC and Oxford Economics, "Assessing the global transport infrastructure market: Outlook to 2025".

Challenges for investors

On the face of it, the path to aviation growth seems relatively straightforward. However, achieving this is not without its challenges.

We expect to see emerging markets' development arriving through investment in new infrastructure and privatisation of airport assets. While airport privatisation is nothing new, there exists a huge capacity for more of this to be carried out in the non-OECD countries, where a large proportion of airports are still state-owned and operated. Emerging markets stand to gain greatly from international expertise in running and managing airport assets effectively. Airport concessions are an increasingly common type of deal; Brazil and the Philippines are examples of those governments currently in the process of privatising a number of their previously state-owned airports.

National regulation and lack of regional coordination continue to create difficulties for international investors. We see an increasing appetite for aviation infrastructure investment as evidenced by the projected expenditures for the coming decade. (See Figure 2.) However, some of these key investment markets, remain reluctant in opening up opportunities to international investors and operators. Some of the biggest investment markets such as China, Indonesia, and the Philippines still have stringent ownership regulations, limiting scope for foreign investment. We believe that greater corporatisation and privatisation is needed to bring new stock to the investor market.

Furthermore, whilst privatisation has certainly had its moments of success in the past, a level of caution must be taken around such deals. In particular, governance, economic regulation, and ownership structures must complement the long-term growth strategy of the airport.

New market participants

Despite the challenges, there is clearly opportunity to be seized in these developing aviation markets. Established heavyweights such as TAV also have an eye for developing aviation markets with airports in Tunisia, Macedonia, Georgia, and Turkey. In this space we are also seeing an array of new bidders who appear more comfortable with higher risk investments. Many of these new bidders have appeared as a result of markets moving towards privatisation and are therefore more likely to invest in higher risk assets compared to what one would typically see with investors from OECD countries. For example, following privatisation in South America,

- Argentina's Corporación America has stakes in almost 30 airports, predominantly in Latin America although also with some interests in Italian airports including Florence Peretola, and Trapani Birgi Airport. The company has also demonstrated their higher risk threshold in bidding for a number of regional airports in Greece during the privatisation last year.
- ASUR is another big player in emerging markets, with interests in a host of Mexican airports, while Brazilian CCR own an airport in Brazil and Ecuador.
- Agunsa, a Chilean developer and investor, has stakes in four airports in Chile and is currently bidding on an airport in Colombia.

In the sections that follow, we take a look at some interesting growth opportunities.

Central and Eastern Europe

Central and Eastern Europe (CEE) are rapidly catching up with Western Europe with optimistic forecasts across the region. During 2015-2025, Albania, Serbia, and Slovenia are expected to see some of the highest growth rates in the region, with traffic increases per year of 6.9%, 6.6%, and 6.3%, respectively. LCCs have had great penetration into the CEE aviation market, increasing competition by offering competitive fares, and we expect to see this trend continue. We are also seeing increasing activity in privatisation with the recent privatisation of airports in Ljubljana, Slovenia, and Zagreb, Croatia, and upcoming privatisations of Belgrade Airport in Serbia and the Lithuanian Airports.

Asia

Globally, India has one of the highest forecasts for airport infrastructure investment; it is expected to see an average annual increase in infrastructure spend of 15.4%, amounting to around US\$14 billion over the next decade. Given Asia's high economic growth (7.4% in 2014) and expanding population, such traffic growth is not surprising. Subsequently, India's outdated airport infrastructure is undergoing serious redevelopment to facilitate the anticipated traffic growth, reflected in the high investment forecasts. The loosening of controls on foreign investment and privatisation of airports should facilitate meeting of these targets.

Vietnam is expecting high growth in air traffic; forecasts predict a CAGR of 10.1% in Vietnamese air traffic during 2014-2024. Vietnam is expecting to see a cumulative spend on airport infrastructure of US\$16 billion from 2015-2025. These predictions come amid the privatisation of the state-owned Airports Corporation of Vietnam, easing of visa requirements for visiting the country, and high GDP growth (6% in 2014).

Indonesia presents another South-East Asian country primed for significant airport infrastructure investment. With strong forecasted traffic growth of 4.8% per year until 2025, the archipelago is planning to invest US\$1.7 billion in 2015, rising to US\$3 billion by 2025, a rate of 5.8% per year. A wide range of opportunities for infrastructure investment lie in the country around the expansion and redevelopment of airports in addition to opportunities in refurbishment of air traffic control assets and ground handling. Foreign investment encouraged by the government aims to spur this growth.

China currently hosts more than two-thirds of the airports now under construction globally. However, this growth is not without its challenges. The first challenge is the fact that China's armed forces control most of the nation's airspace, estimated at around 70-80%. Routes are particularly restrictive above and around cities, leaving very narrow corridors for civil flights to operate within. Secondly, air-traffic controls in China require landing aircrafts to have a wider cushion between each other, as much as 6-10 miles in contrast to around 3 miles in the US. As a result, the capacity of the restrained airspace around major airports is lower than in the US and Europe. Added to this are direct challenges to investors – whilst the Chinese government is investing hugely in airport infrastructure, airports in the country are still largely state-owned. In conclusion, for Chinese skies to accommodate the nation's ambitious expansion plans, authorities will have to adopt more flexible regulations and air control methods.

Conclusion

There are a wide range of factors affecting decision-making around airport investment attributable to the significant degree of heterogeneity across global aviation markets. As we have explored, one asset cannot be viewed in the same light as another. Privatisation, competition, and regulation are some of the core actors currently at play in both emerging and developed markets.

Despite investors' bearish outlook on emerging economies, these countries are continuing to present interesting and potentially fruitful opportunities within the aviation market. The exponential traffic and investment growth experienced in the past decade by countries such as China is now being passed on to other developing aviation markets such as CEE. That said, opportunities still remain through continued growth in what are now more mature markets, provided that other factors such as regulation are more favourably balanced towards international investment.

It is evident that the aviation market is tied in to many aspects of the global economy, which is what makes it such an interesting sector. This link highlights the significance of its role in economic and social development, particularly in emerging markets. For investors, the development of these countries brings exciting and potentially fruitful opportunities that, if managed effectively, can lead to economic and social gain for both investor and consumer. Understanding and overcoming the underlying challenges in these markets may afford one the opportunity to pioneer the aviation market of the future.

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Air connectivity: Why it matters and how to support growth

Claudia Bottini and Hayley Morphet

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 Organization (ICAO) defines it as an indicator of a network's concentration and its ability to move passengers from their origin to their destination seamlessly.¹

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.

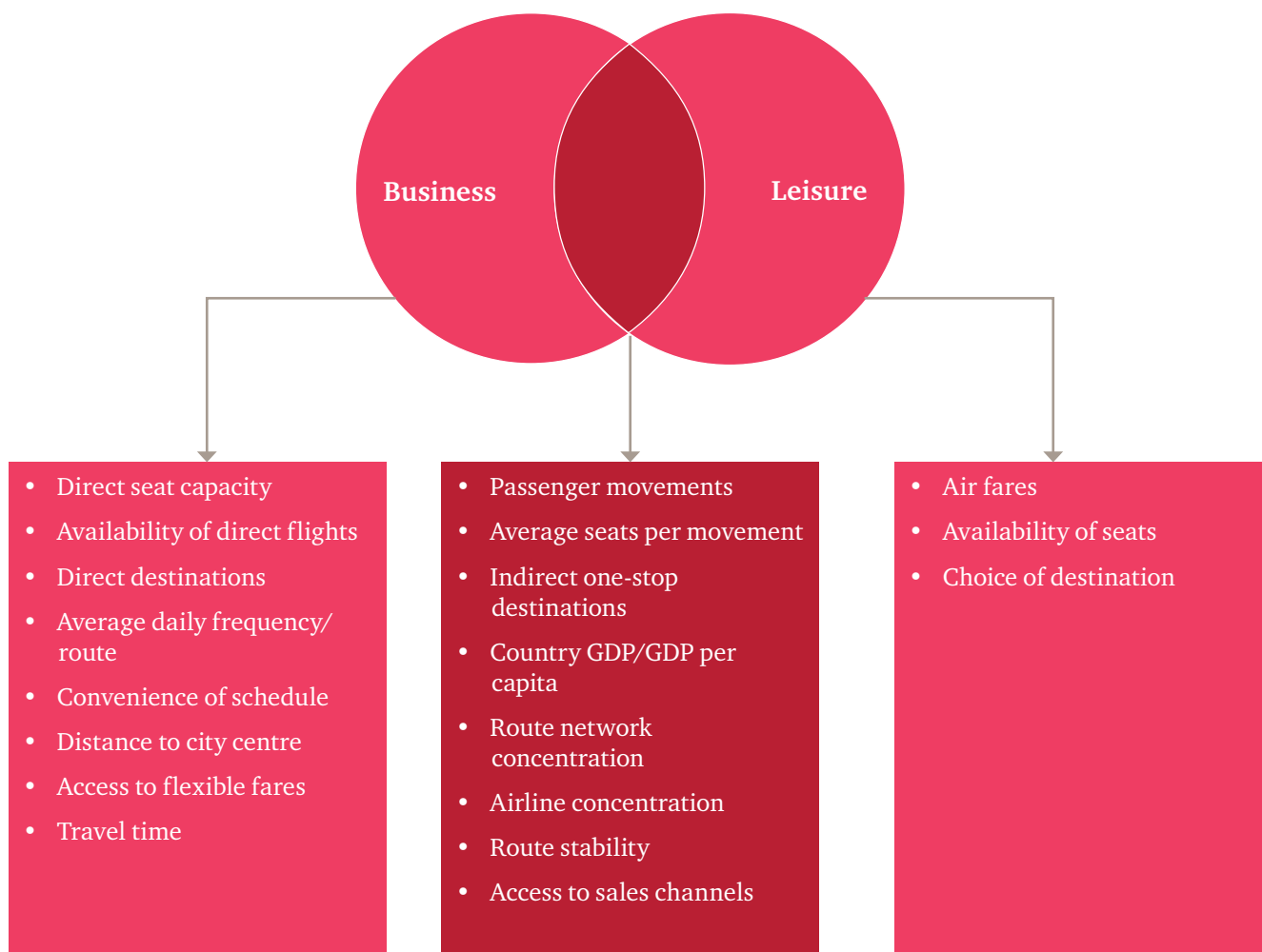
By understanding how air connectivity is measured, how it has changed, how it relates to economic growth, and what drives it, key aviation stakeholders (including states, airports, and airlines), can make strategic decisions on how to enable and unlock the air connectivity potential of a country.

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.)

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

Figure 1: Air connectivity measures



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. (However, price 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.

- **Visiting friends and relatives** passengers are travelling 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 that takes multiple variables into account.

Table 1: Air connectivity indices in aviation economics literature

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

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.

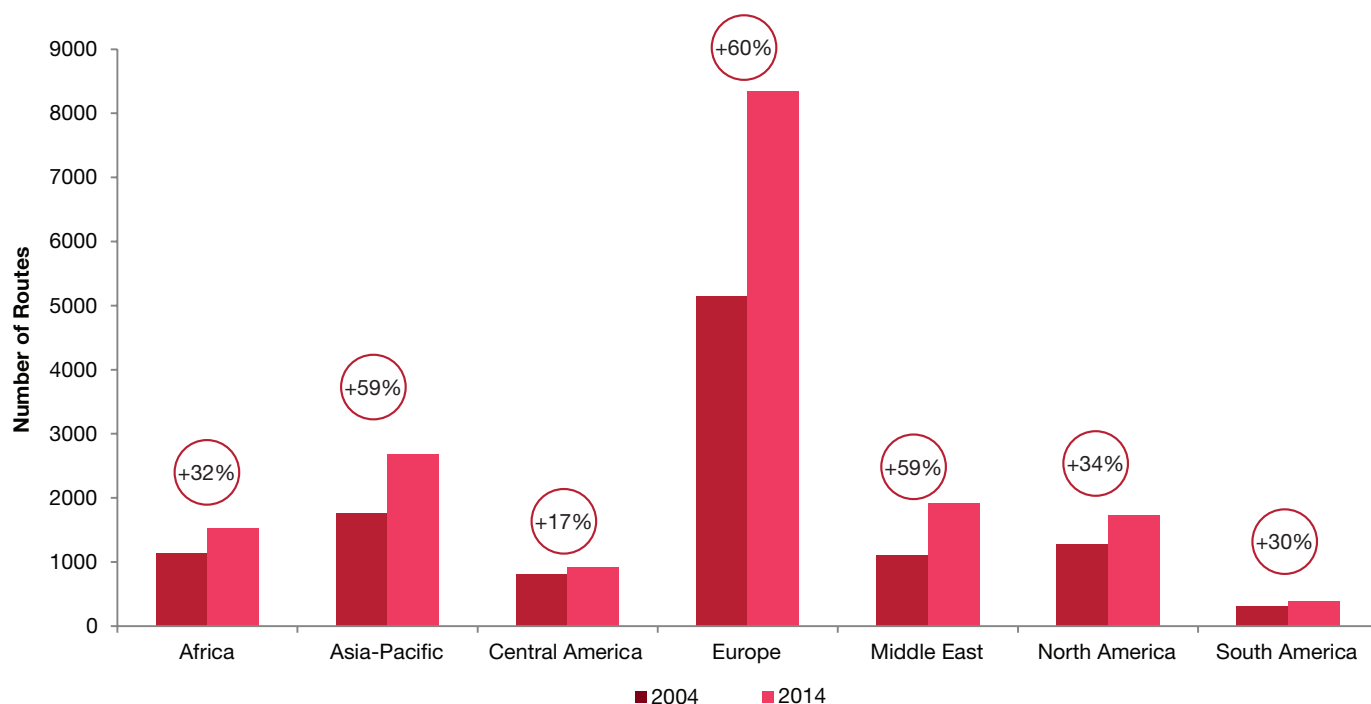
Air traffic growth, which was once led by North America and Europe, is now fronted by the Middle East, the Asia-Pacific region, and Latin America, which have experienced strong growth over recent years.

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 by the Middle East and Asia. Meanwhile, Europe's routes increased by 60% since 2004 as a result of the increased penetration of LCCs and the subsequent increase in point-to-point services. (See Figure 2.)

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.) Asia, 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.

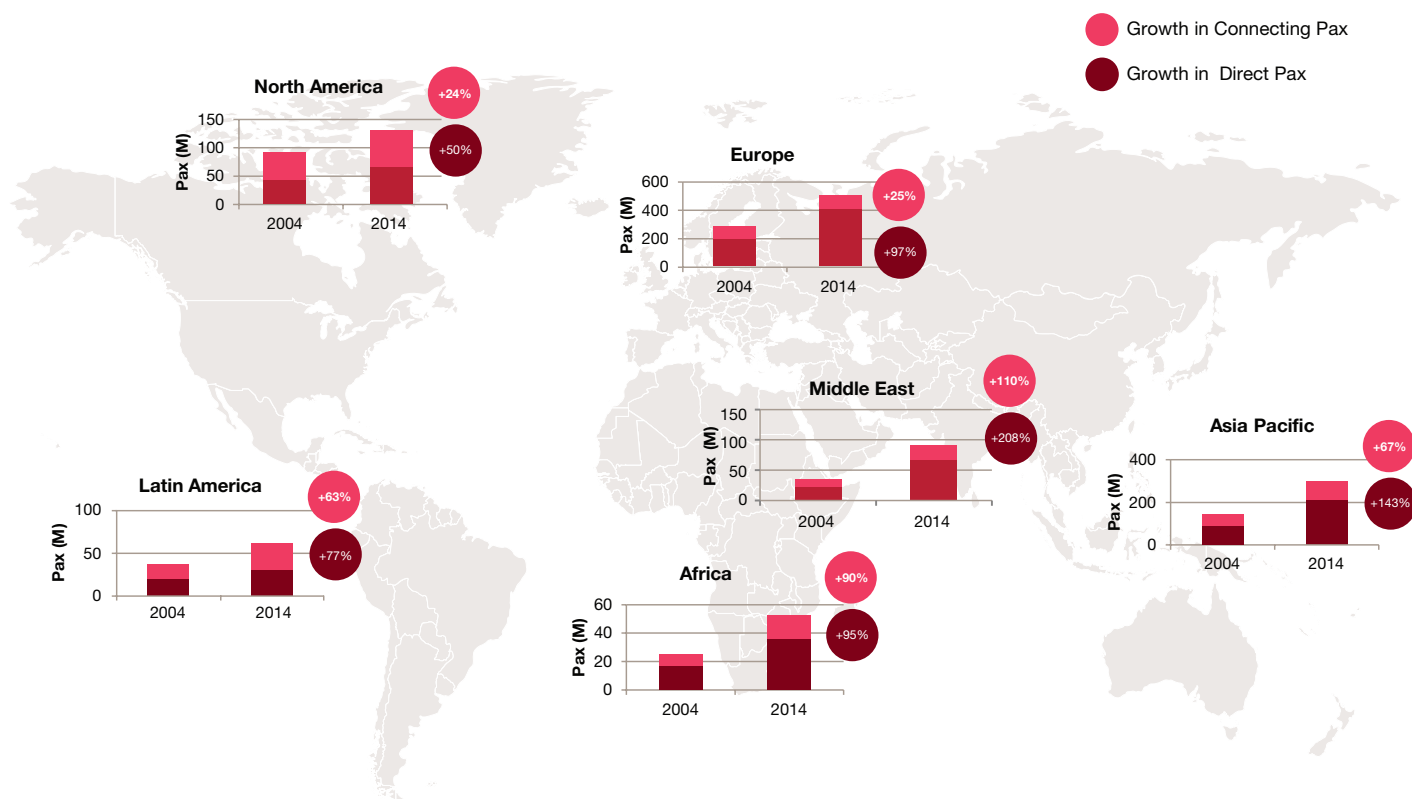
Figure 2: Number of international routes by region: 2004 and 2014



Note: International routes only, excluding domestic in-country traffic

Source: Milanamos Planet Optim Future, PwC analysis

Figure 3: Direct and connecting passenger traffic, 2004 and 2014



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

Source: Milanamos Planet Optim Future, PwC analysis

How are air connectivity and economic growth linked?

Aviation generates significant benefits for the global economy. In 2012, it contributed US\$2.4 trillion to the global GDP (3.4%). Direct benefits (such as employment and economic activity generated by the air transport industry) are estimated at about US\$606 billion; indirect benefits (generated by employment and economic activity of suppliers of the air transport industry) are estimated at US\$697 billion.^{3,4}

Aviation also plays a key role in enabling the economic growth of countries that rely on major hubs such as Singapore and Dubai. In Dubai, for instance, aviation generates about 28% of the city's GDP.

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

³ ATAG (2014), Aviation Benefits Beyond Borders

⁴ Note: Other benefits generated by aviation include induced and tourism catalytic benefits, which in 2012 made up for the remaining US\$1.131 billion.

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:⁵

- **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; Incheon; the Middle Eastern hubs of Dubai, Abu Dhabi, and Doha; and 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 Coast⁶ North American traffic to Asia.

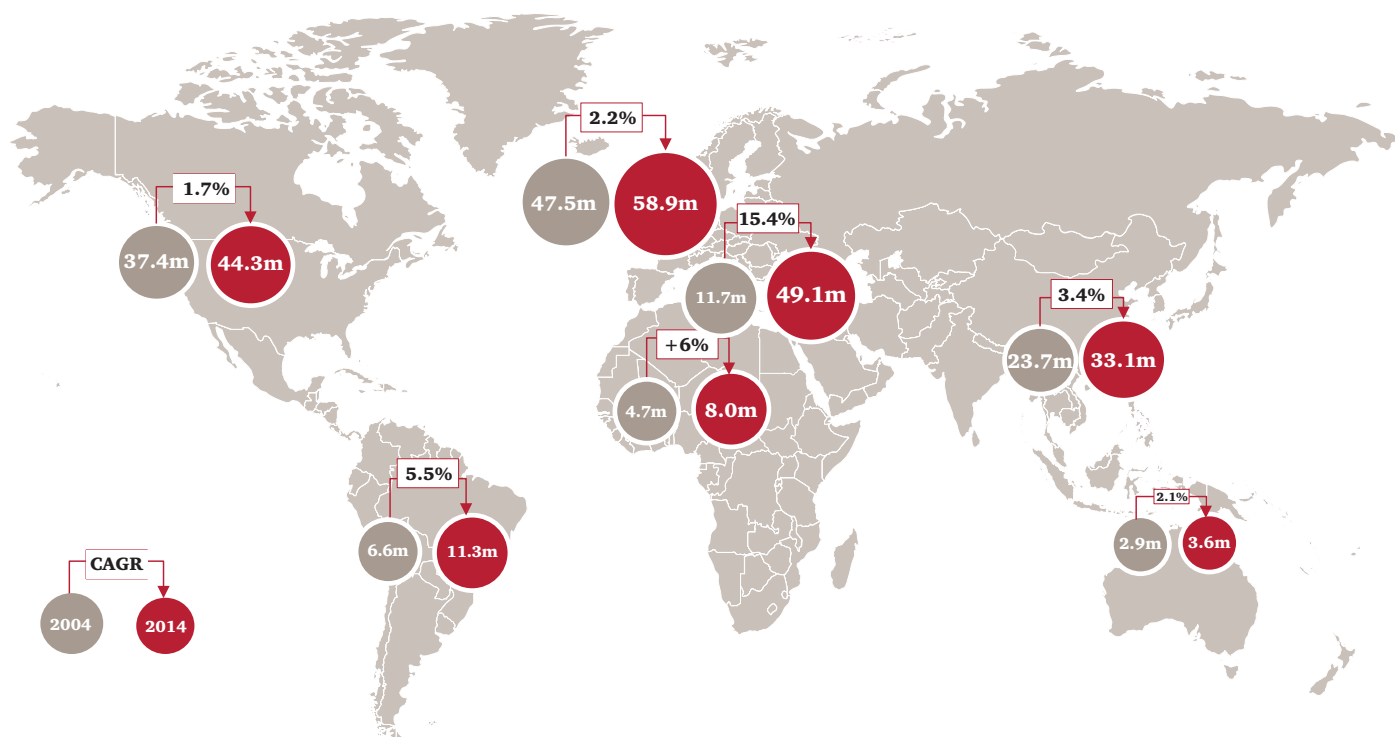
- **Asia** – Asian hubs such as Singapore and Hong Kong have traditionally enjoyed advantages with respect to traffic routes between Europe and Australasia and with respect to other points in Asia where traffic to and from Europe is less developed (such as Indonesia and Vietnam).
- **Middle East** – 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 15% 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.

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

⁶ 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



Note: The chart only shows interregional 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.

Source: Milanamos Planet Optim Future, PwC analysis

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 companies 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.

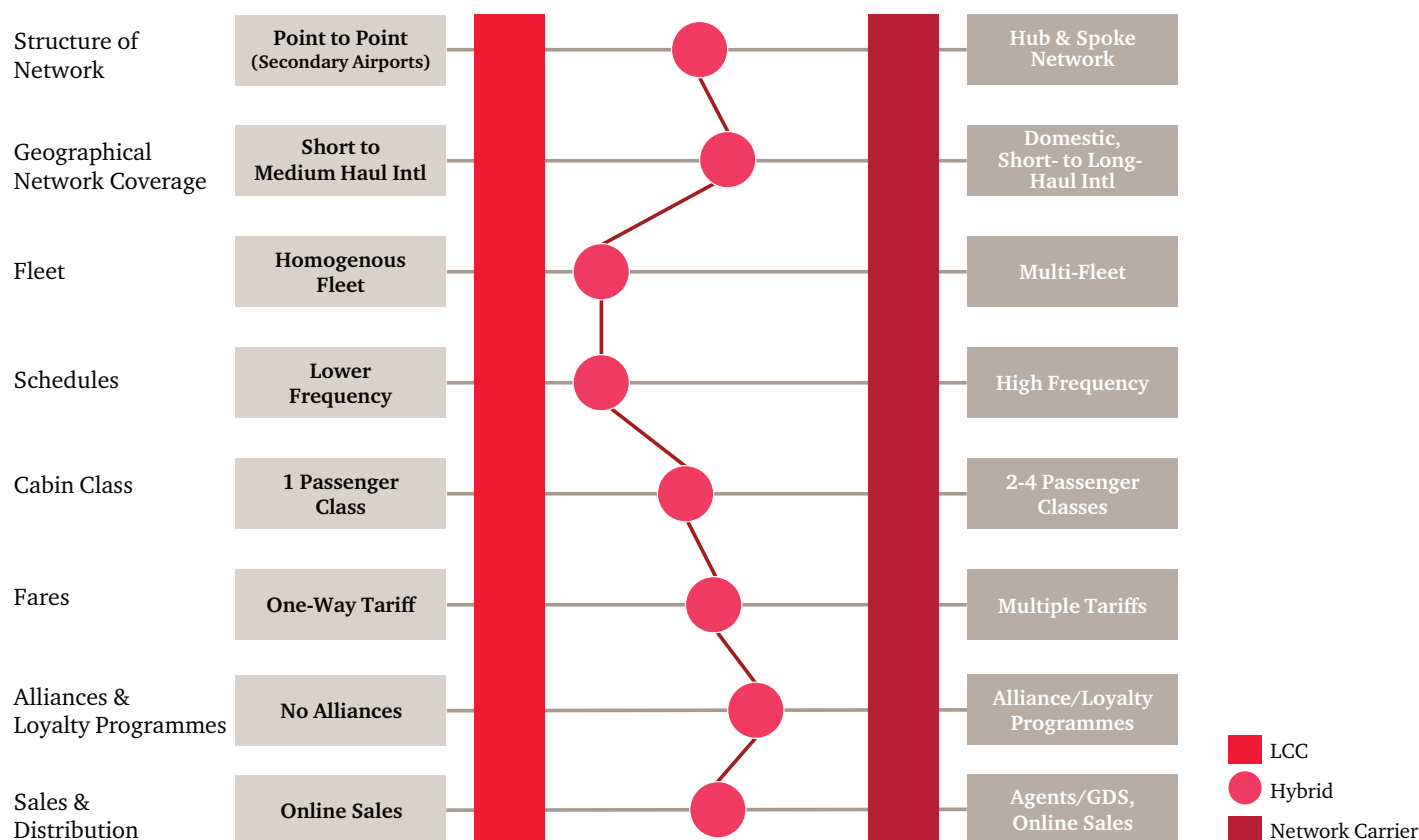
Airline business models

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 as well as 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



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. Most 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 influence 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 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 establishing and building up their networks to support the linkages a country has with the rest of the world.
- Developing regulatory and economic frameworks that 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 finding new routes to enhance their network connectivity. 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 towards ensuring that the right steps are taken to improve or maintain the global position of a country (or city) within the global air network.

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Keeping airport projects on course in a turbulent world

Pierre-Edouard Pichot and Richard Scott

The developers of airport construction projects on the ground are much like the air traffic controllers managing flights in the sky. They both use modern systems to make sense of the large volumes of data required to keep track of so many moving parts. They still require experience and judgement to make the right decisions in response to minute-by-minute fluctuations and the large-scale disruptions brought by external factors. They need to be ever vigilant and highly flexible to respond to fast-changing conditions. Those traits can save airport developments from flying too far off course, and thus avoid major delays, cost overruns, and project disputes.

Developers are wise to plan for all these risks, setting a course secure in the knowledge that they will be able to respond to events and navigate the inevitable turbulence on the way. By embracing flexibility at all stages of the project, they can shape their asset to deliver the value they are looking for, while adapting to present and future market trends.

Unfortunately, many airport developers fail to establish the proper controls over their projects and are thus blind to troubles building on the horizon. They do not fully understand the risks and do not manage them effectively. They miss their chance to avoid disruption by taking early evasive action, and they appear unprepared when struck by events. Without contingency plans, they need a long time to respond. Often, they don't realise the severity of delays and cost overruns until the project is facing serious difficulties.

External factors to consider in airport investment

This is a volatile time for air travel. It is difficult to predict accurately the volume of air travel and passengers' needs 10 or 20 years into the future. During the construction phase, airports may have to adapt to changes in their mix of airlines, the size and shape of jet planes, and the rapid advance of technology that can affect airport operations as well as passenger behaviours.

Moreover, a particular airport could suddenly face political instability and see a sharp drop in passengers in the midst of a major expansion. And, airport developments tend to be highly politically sensitive and attract media attention.

Many airport developers fail to establish the proper controls over their projects.

The risks of veering off course are greater for airports than most big-budget infrastructure projects. Investors willing to put their money into major airport infrastructure need to recognise that such complex efforts are much more than a construction project, where most of the risks can be managed through appropriate procurement, contractual arrangements, and careful planning of the delivery.

As much as possible, investors and project owners should consider external factors that will affect the completed airport. For example, sensitivity of the project to issues such as the home country's GDP and fuel price fluctuations should be factored in during project planning because they could have a major impact on the viability of the project's business case.

It's impossible to plan for unexpected geopolitical risks that could affect trends in the aviation market and industry, but project developers should be ready to make as many adaptations as possible during the construction process. A major devastating event such as the terrorist bombings of the World Trade Center and Pentagon in 2001 and the global financial crisis in 2008 can sharply change air travel patterns and affect airport projects. More recently, the Ukraine-Russian conflict has caused some airlines to alter their flight paths to avoid the fate that befell a Malaysian Airlines jet that was shot down.

Indeed, highly rated Malaysia Airlines, as well as the country's airports, could suffer from public perception, which has suddenly turned quite negative through no 'apparent or proven' fault of the airline or airports.

Malaysia Airlines could face serious financial problems, which may affect the success of Kuala Lumpur International Airport and other Malaysian airports. But there's little investors can do to plan for such dramatic developments.

Setting direction with confidence: The business case

Rigorous scrutiny of the business case provides confidence that an airport is investing in the right project. In developing the business case, investors and airport owners should identify the value they expect, how it is going to be realised, and what the risks are to that value. They should be inquisitive and test the fundamental assumptions and forecasts on which the business case is constructed. They will also need to recognise that the case could be sensitive to factors beyond their control. Once the project is initiated, they should focus on the areas where they can influence the outcome.

With any type of project, the greater the uncertainty about demand and other factors, the greater the risks will be. Given the volatility of air transportation these days, the outlook can be particularly cloudy and add even more uncertainty to an already complex project. So, it's essential that investors and airport owners devote the necessary time and engage with the airport's stakeholders, including regulators, airlines, suppliers, and operators, to help build a business case that's robust and flexible enough to adapt to a future shift in trends, including external factors where they have little control.

Of course, a key factor affecting the business case of any airport is passenger demand. Assumptions and projections need to be tested with various scenarios to validate model projections. Unfortunately, some project owners and investors fail to spend the necessary time to do thorough enough research and consider all of the potential scenarios.

For example, Ciudad Real Central Airport in Spain missed the mark in its projected passenger traffic numbers. The airport opened in 2009 and was intended to accommodate 600,000 passengers annually, providing international service to Madrid via a high-speed rail connection. But the airport attracted only 53,000 passengers during its first year and never reached anywhere near the anticipated capacity, losing several airlines' business and ceasing operations in April 2012.

What went wrong? The airport owners miscalculated a variety of things. The new airport was intended to offer competing service to capacity-constrained Madrid Barajas, but Madrid Barajas' fourth terminal construction project reduced the constraint and hence the reason for Ciudad Real Central Airport's existence.

A key factor affecting the business case of any airport is passenger demand.

Airport operators need to embed flexibility in their plans.

Preparing to do the project right – and planning for inevitable changes

Airport projects are especially complex because they involve such a wide variety of stakeholders and revenue sources. Airport developments also are typically very large in scope and have a long timeline from planning to completion, increasing the likelihood of design and other changes along the way.

Many international airports are intended to be architectural statements in addition to transportation infrastructure. This has been a particular trend in airports constructed in the Middle East. Such unique designs may draw attention, but there can be a tension between form and function, and they are more vulnerable to problems in design and construction because they've never been done before.

A significant challenge for an airport investor is to select a delivery model that allows the transfer of some delivery risks to specialist third parties (designers, contractors, operators), whilst retaining the ability to respond to changes in the constantly evolving aviation industry. A compromise is often required where the owner retains significant levels of risk and must actively participate in project delivery.

Complexity, novelty, and susceptibility to change are all factors seen in airport projects. Successful airport development therefore demands the highest standards in project management and control. The delivery organisation and processes need to be

Carefully planned from the outset to create proper oversight, communication, and control. Significant issues need to be identified and escalated so that action can be taken quickly when risks of delay and cost overrun surface. This increases the likelihood that an airport development effort will stay on course and be flexible enough to respond to any turbulence.

Getting projects back on track

Scope change is the one sure thing to count on with an airport construction project. Thus, airport operators need to embed flexibility in their plans. They should agree up front with designers, contractors, and stakeholders that there will most likely be changes along the way because of fluctuating market trends. They must be prepared to reassess the business case frequently to take advantage of the opportunities that change brings as well as mitigate the risks.

London's Heathrow Airport designed its new Terminal 2 to be a home for the Star Alliance airlines and reduce transfer times to improve the passenger experience. But during construction, some of the fundamental assumptions of the terminal operation were tested by the sale of BMI, the carrier with the largest presence in the terminal, and its integration into British Airways. Fortunately, strong project controls allowed changes to be made even late in the construction programme to accommodate a new mix of carriers – within the budget and without affecting the opening date.

Airport developers must identify risks, assign them appropriately, set up controls for their own risks, and monitor the risks they have transferred to contractors or other parties. Where risks or new requirements materialise, integrating teams with representatives of all key stakeholder groups can help project leaders respond in a considered manner, balancing immediate action with the need to maintain the momentum of project delivery.

Changes in the midst of construction, of course, are much more expensive than incorporating the features in the original design. Qatar's new Hamad International Airport was delayed in part because of changes and expansion. The Associated Press estimated that the price tag had grown to at least US\$15 billion by the time the airport opened for business in 2014.

Airport developers need to evaluate any project changes and approve only those they consider truly necessary. If they decide they need a larger airport as they proceed because of changing market conditions, they must closely examine the implications for revenue, maintenance costs, and other expenses.

The contractor and designer should be given adequate time to come up with the most appropriate response. The solution chosen might not be the most economical, but it may be the most efficient to respond to the future, maximising the value to be delivered by the project in the long term. A successful delivery plan will allocate power to the right people to make the right decisions with a long-term objective in mind.

To minimise expenses, airport designers are advised to build in as much flexibility as possible. If they use modular design, they can move or knock down walls to change configurations. Such a simple adjustment could provide more room for baggage claim, for instance, if passenger traffic suddenly rises and there is need to take space away from another area, such as duty-free shops. Flexible design also could allow terminals to more quickly add parking slots for planes or make modifications to accommodate larger or smaller planes.

Learning from the past

While successful delivery of modern, complex projects is supported by powerful data analysis and systems, experience is irreplaceable. Some airport owners have learned from mistakes to keep future projects on course. For instance, London's Heathrow Airport and British Airways experienced multiple problems with their Terminal 5 opening, but Terminal 2 had a much more successful opening a few years later.

Among other things, Heathrow and British Airways failed to do adequate testing before opening Terminal 5, resulting in numerous problems. The airport and airline were also too ambitious in trying to open on Day 1 at near-full capacity. On opening day, 34 flights were cancelled and baggage check-in was suspended. On the second day, 42,000 bags were not shipped with their owners. Within five days of opening, more than 300 flights were cancelled.

Six years later, when planning the opening of the new Terminal 2, Heathrow's owners made several operational decisions to make the opening as smooth as possible. While Terminal 5 opened at near-full capacity, Terminal 2 opened operating at 10% capacity with only 34 flights on the first day. And unlike Terminal 5's plans to move British Airways' operations to the terminal very quickly, Terminal 2 housed only one Star Alliance airline on opening: United Airlines, with Aer Lingus, Air Canada, Lufthansa, and other carriers moving operations over during the remainder of 2014.

The importance of getting airport projects just right

An airport is usually a landmark for a region, a country, or a continent. It is the first point of entry to a new territory, a true gateway to a new culture – and first impressions last.

So, it's critical to try to get airport projects right despite the uncertainties of today's air travel environment and the complexities of such projects. How many passengers complain about queues at customs or time to walk to the gate? And this is the first memory of their trip.

Such issues could easily be resolved with adequate planning and project management. Designing and constructing airports require careful long-term thinking and integrated planning with flexibility embedded at all stages of the project.

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It's critical to try to get airport projects right despite the uncertainties of today's air travel environment and the complexities of such projects.

Airport infrastructure in Asia

Coping with the demand surge

Edward Clayton and Batari Saraswati

Airport operators and governments in Asia are competing to build some of the world's biggest airports, with capacities well in excess of 100 million passengers per annum. However, our experience is that owing to exponentially increasing complexity, airports suffer from significant diseconomies of scale above around 50 million passengers per annum, both for the airport operator (capex and opex) and for the airlines, service providers, and passengers using them (time and cost to move around the airport). At the same time, the network benefits of these very large airports do not increase as fast as their size. Therefore, Asian airport planners and operators will either need to acquire capabilities in multi-airport systems – or radically change the way in which airports operate to overcome the inherent scale diseconomies of mega-hubs.

Asia's rapid growth in the commercial aviation sector in recent decades has positioned the region as the largest and fastest growing in the world. The growth in Asia is expected to remain resilient, forecast to continue as the world's highest growth region well beyond 2020. However, aviation infrastructure is not keeping pace with

this growth; many of the Asian hubs are already operating above their planned capacity, resulting in a rapid escalation of delays since 2010. Current plans for constructing mega-hub airports are not effective from a cost perspective and will fail to keep up with demand. Instead, governments should plan larger numbers of medium-sized airports to keep costs manageable, gain maximum operational efficiency, and build a wider aviation network, allowing commercial aviation to continue in its role as a key enabler of Asian economic growth.

Asia as a high-growth region

In recent decades, Asia has emerged as the leading region in aviation traffic, currently accounting for 30% of the world's revenue passenger kilometres, up from 24% in 2004. As the world's fastest growing region, Asia should see its growth remain resilient at over 6% per annum over the next two decades.¹ In contrast, established regions such as Europe and North America are expected to experience relatively slower growth, with opportunities scarce because of market maturity, environmental concerns, and increasing availability of substitutes such as high-speed rail.

The case for Asia's surge in demand for airport infrastructure is explained by three factors – liberalisation of the Asian markets, growth in wealth and size of the Asian middle class, and a lack of alternative modes of transport.

The growth in Asia is expected to remain resilient, forecast to continue as the world's highest growth region well beyond 2020.

¹ IATA

Since the 1980s, the opening of formerly closed countries in Asia to global trade has massively stimulated the movement of both goods and people in the region. Free trade agreements (FTAs) have driven the convergence and integration of economies within Asia, stimulating intra-regional trade. Concurrently, Asian countries have liberalised visa requirements and air travel agreements. For example, the ongoing programme of ASEAN air services liberalisation has already resulted in significant increases in flights between capital cities, and should enable the opening up of many secondary airports to intra-ASEAN flights in the remainder of 2015.

The liberalisation of Asian economies and travel restrictions has opened travel opportunities to new population segments, many of which were previously unable to travel by air. And this trend is expected to continue, with

the launch of the ASEAN Economic Community on 31 December 2015 and the October 2015 signing of the Trans-Pacific Partnership Agreement (TPPA) by the negotiating governments.

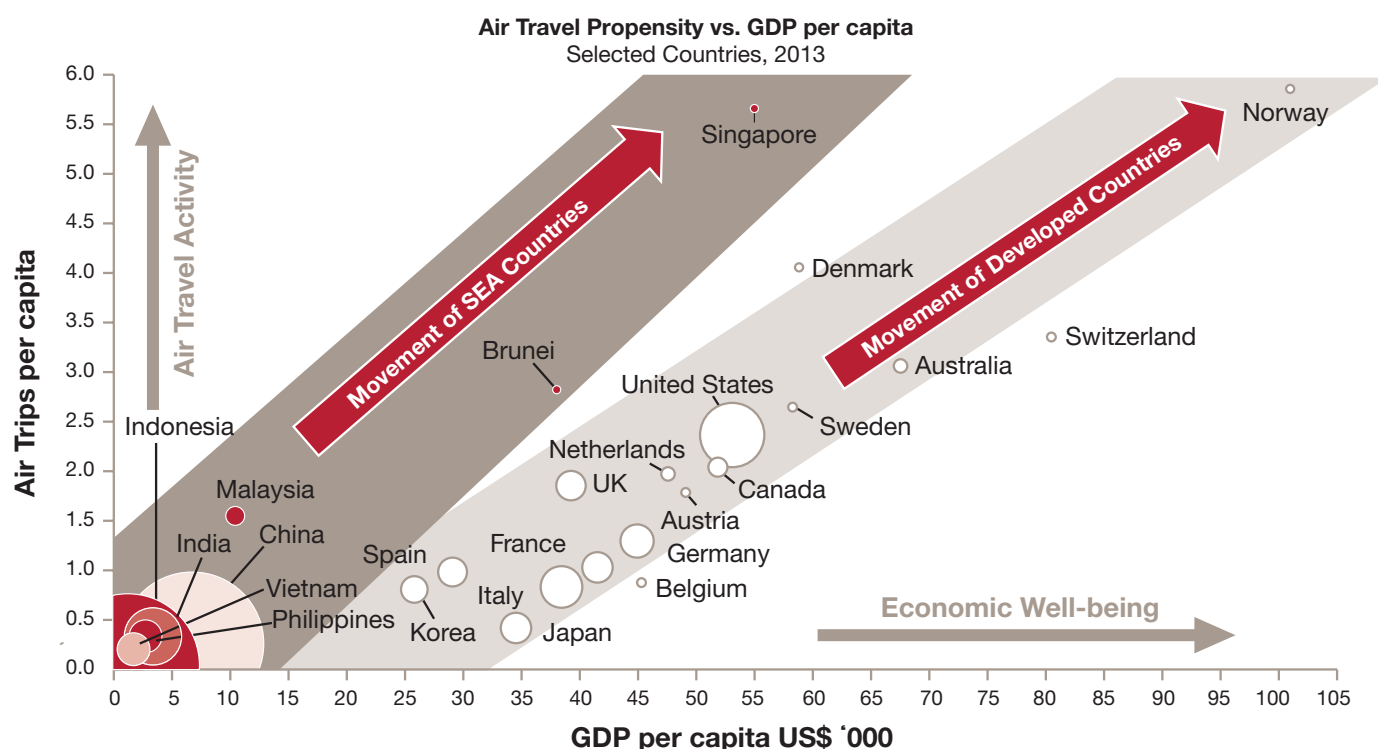
Asia already has the largest share of the world's urban population in its cities; this is unleashing a massive wave of new travel. The reasons are simple: people migrate to centres of population where they are able to earn higher wages; they can then travel because of the availability of airport infrastructure in proximity to such cities. They also have the motivation to do so, in many cases for visits to their home towns, but also for tourism. Asia is moving rapidly towards being a higher income region, and is already home to 41% of the world's middle class. This percentage is predicted to rise to 68% of the world's middle class in 2033, owing to an expected four-fold increase in absolute numbers of

Asia's current middle-class population.

Empirical evidence shows that the propensity to travel increases with the economic well-being of the country. (See Figure 1.) However, upon further inspection, the trend points toward an even more compelling case for the growth of air travel in Asia. At similar levels of economic well-being, Asians take more trips than the Europeans and North Americans who adopted mass air transport far earlier than Asians.

One reason for this is the lack of alternative modes of transport. Unlike in Europe and North America, where large contiguous landmasses allow intercity highways and railways, large parts of Asia can be reached only by air. Geographical barriers include mountainous regions, the island nature of much of Southeast Asia (the Philippines, Indonesia, Malaysia, Brunei, and Singapore), and sheer distances between major Asian cities. Although

Figure 1: Air-travel activity versus economic well-being



Note: Air trips per capita is calculated as number of departing passengers divided by total population.

Source: The World Bank, Strategy& analysis

high-speed rail is now well developed in parts of North Asia, for much of the continent, air travel will remain the best option from a cost and time perspective for the foreseeable future. At the same time, the extreme density of Asia's populations shows how much potential the markets still have, now that these people are reaching the wealth levels where they can fly.

To fully respond to this demand, Asia's current aircraft fleet has to grow rapidly. This equates to an estimated 13,000 new aircraft deliveries in the next 20 years, more than doubling the size of the current fleet. There are an estimated 3,033 new aircraft deliveries in Asia-Pacific in the next five years. (See Figure 2.) So, the question remains: How can a region set to lead the world in terms of aviation traffic and size of fleet accommodate its growth?

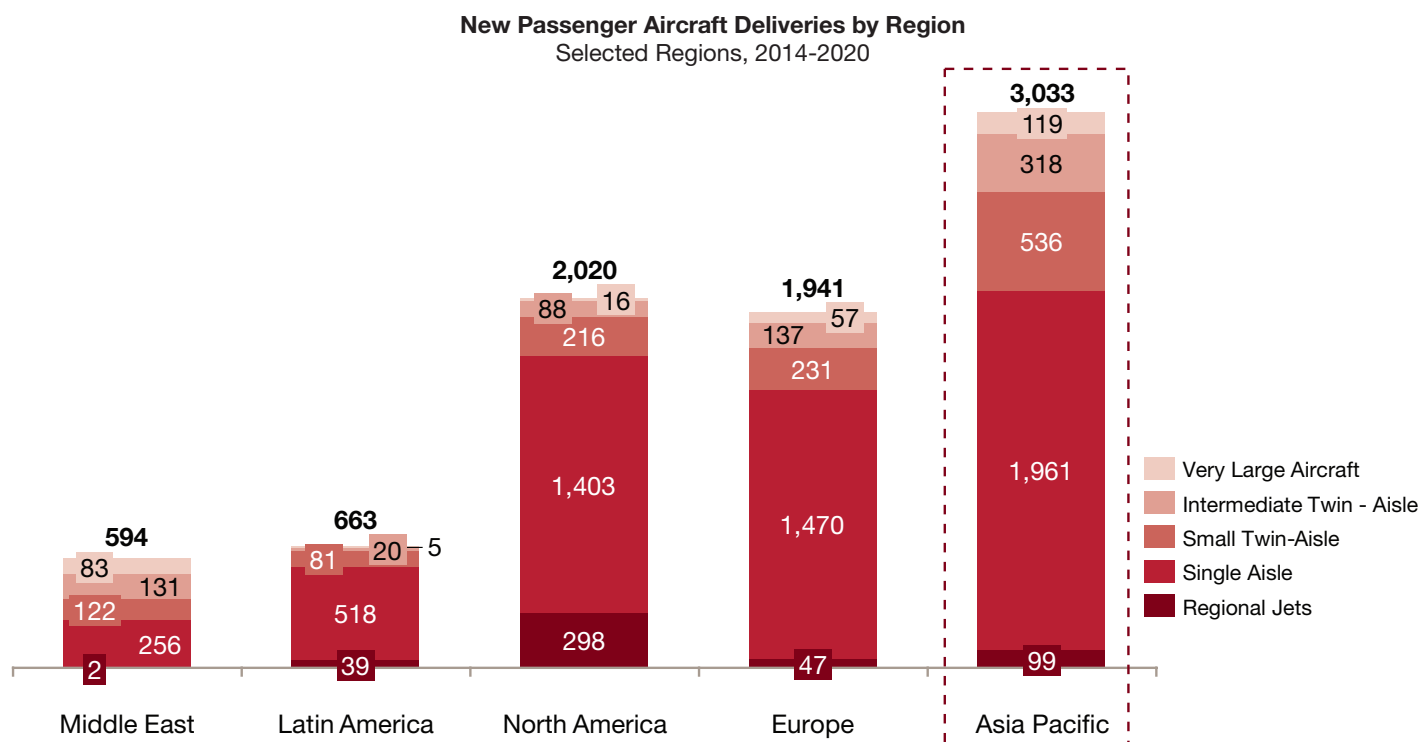
Asia's current aircraft fleet has to grow rapidly.

Current observations in Asia

Development of Asia's airport infrastructure has lagged behind travel growth. Traffic at most major Asian hubs is already exceeding planned capacity whilst even secondary hubs are starting to experience capacity strains. (See Figure 3.) Since the large surge in Asian airport developments in the 1990s, infrastructure has rarely been built ahead of demand. This is a cause for concern, owing to Asia's predicted high rate of growth and given that runway and terminal projects typically require 5-10 years from need recognition to implementation.

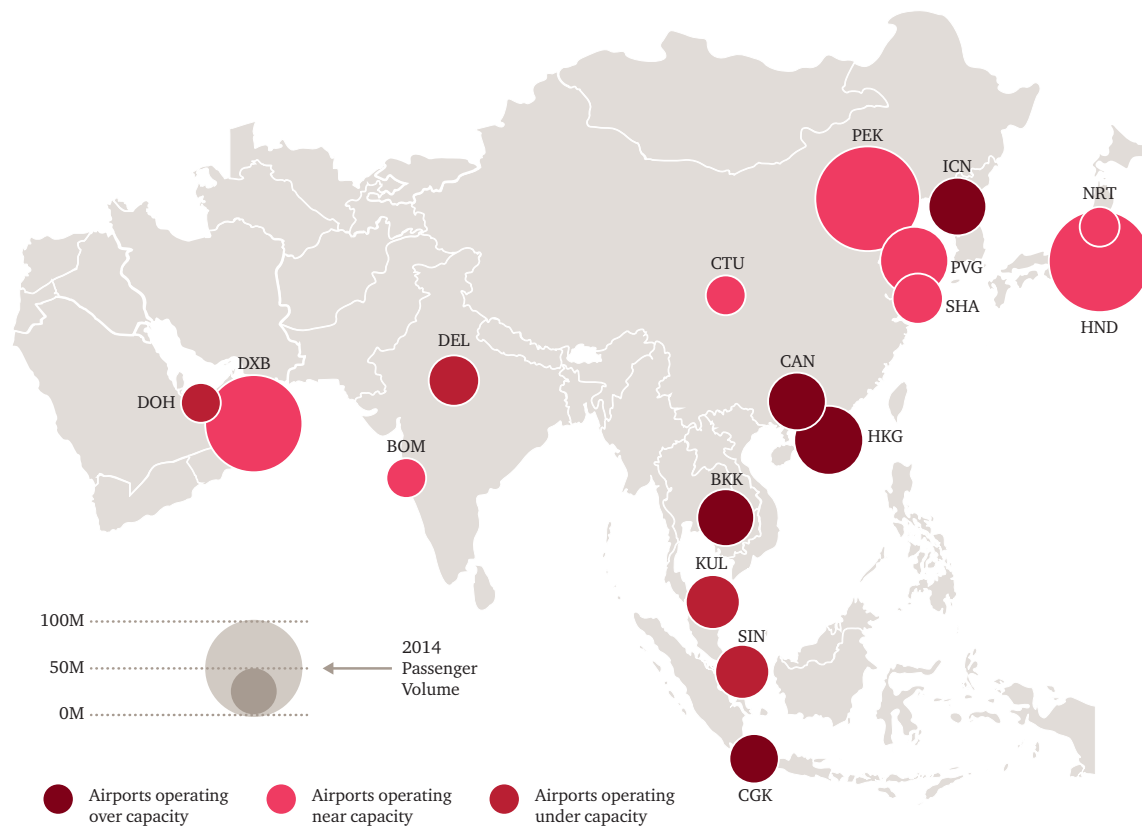
As a consequence, congestion-related delays are rapidly increasing at most Asian hubs. Passengers experience increasingly common flight delays, long queues for take-off, and circling of aircraft in stacks prior to landing. Availability of suitable landing and take-off slots is suddenly becoming scarce, leaving airports unable to cope with any further growth, and leaving airlines with nowhere to operate their newly delivered aircraft. Therefore, it is not surprising that in 2013, only 55% of departures from Asian airports were on time. This is considerably lower than airports in North America and Europe, with 72% and 67% of departures on time respectively. (See Figure 4.)

Figure 2: Aircraft orders by region



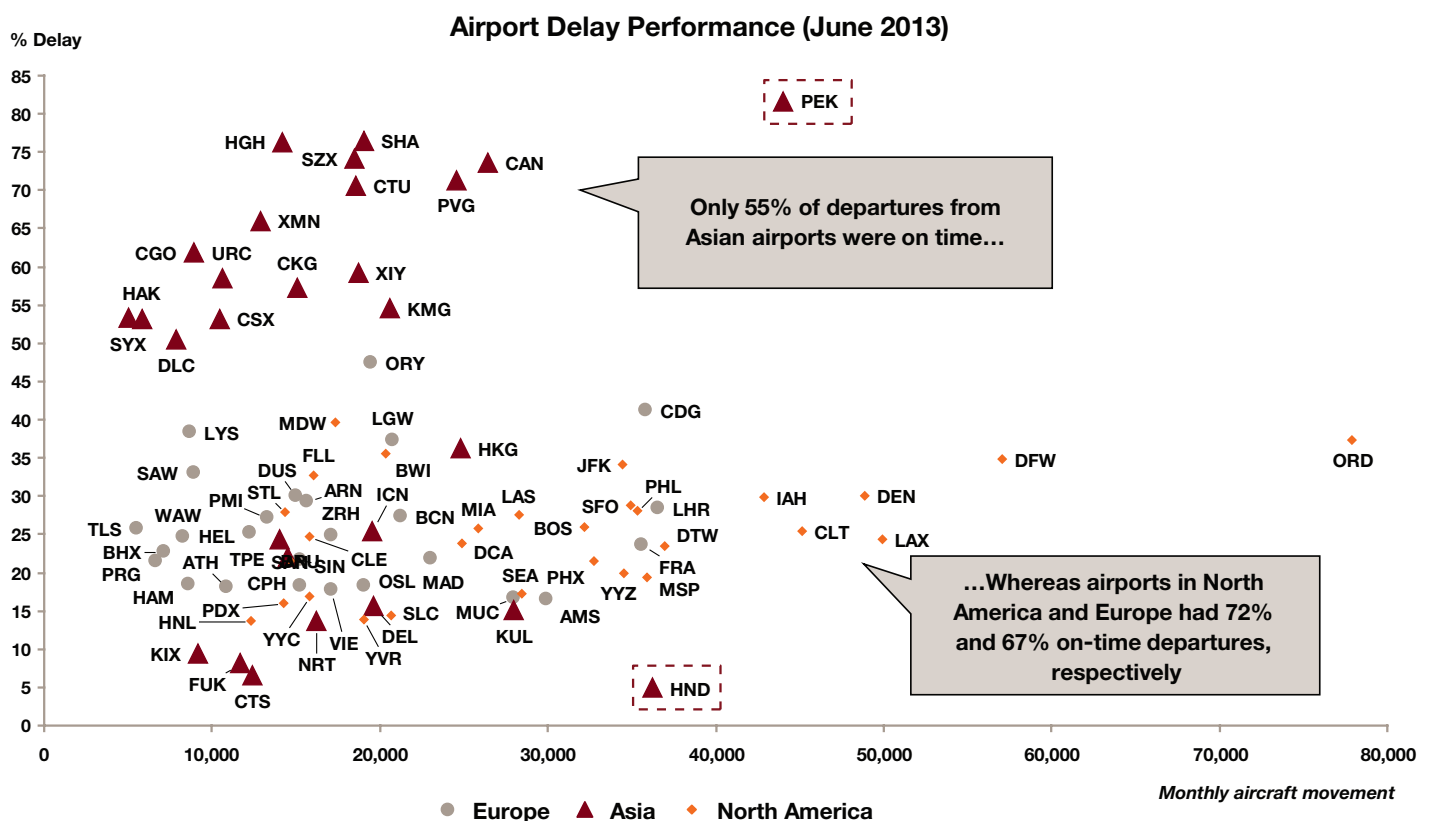
Source: Airbus, Boeing, Strategy& analysis

Figure 3: Passenger capacity of Asian hubs in 2014



Source: IATA, Strategy& analysis

Figure 4: Airport delay performance in June 2013



Source: FlightStats

Specifically, in 2013, less than one third of the flights from China's three largest airports departed on time. And even Changi International Airport and Incheon International Airport, both award-winning and highly rated, struggled to match North America's average percentage of on-time departures.

When we look more closely at the demand patterns, we see some major issues that have exacerbated the problem:

- 1. Liberalisation and the growth of LCCs has led to smaller aircraft being deployed:** Historically, Asian airlines operated large aircraft with relatively low frequency between capital cities. Most of the growth in the past decade has been in narrow-body flights, reducing the ratio of passengers per runway slot.
- 2. Rates of commercial aviation growth have been higher than**

In 2013, only 55% of departures from Asian airports were on time.

forecast: Despite various setbacks such as SARS, the 2008 GFC, and political issues in some countries, aviation in Asia has grown faster than forecasters of the 1980s and 1990s expected – in the period from 2009 to 2014, Asian ASKs increased by over 34%, a CAGR of 8.42%. (See Figure 5.)

However, looking beyond the demand for flights to the supply of infrastructure, we can see that Asia has developed its airports in a very different way from the rest of the world.

As a region, Asia has just 0.22 airports per million inhabitants; the least of any region in the world. (See Figure 6.) However, these airports serve an

average of 1.75 million passengers, well above the mature aviation markets of North America and Europe.

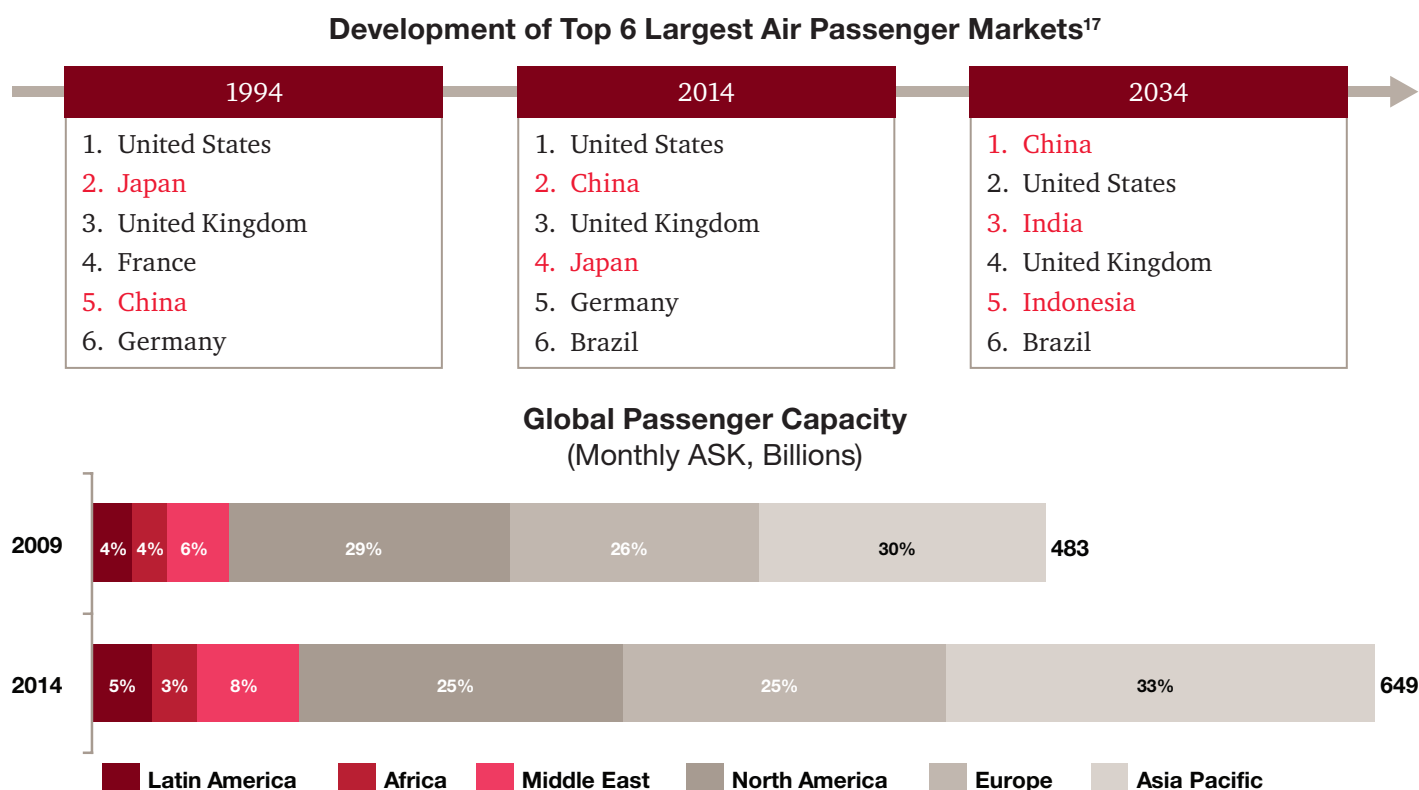
Bearing in mind that Asia's main hubs are already under capacity despite being among the largest in the world, it's clear that Asia has too few airports, and the inefficiencies of larger-sized airports is leading to increasingly frequent delays.

Moving to a better travel world

Asia's current approach – Building mega-hubs

Airport infrastructure spending will be focused on the Asia-Pacific region in the

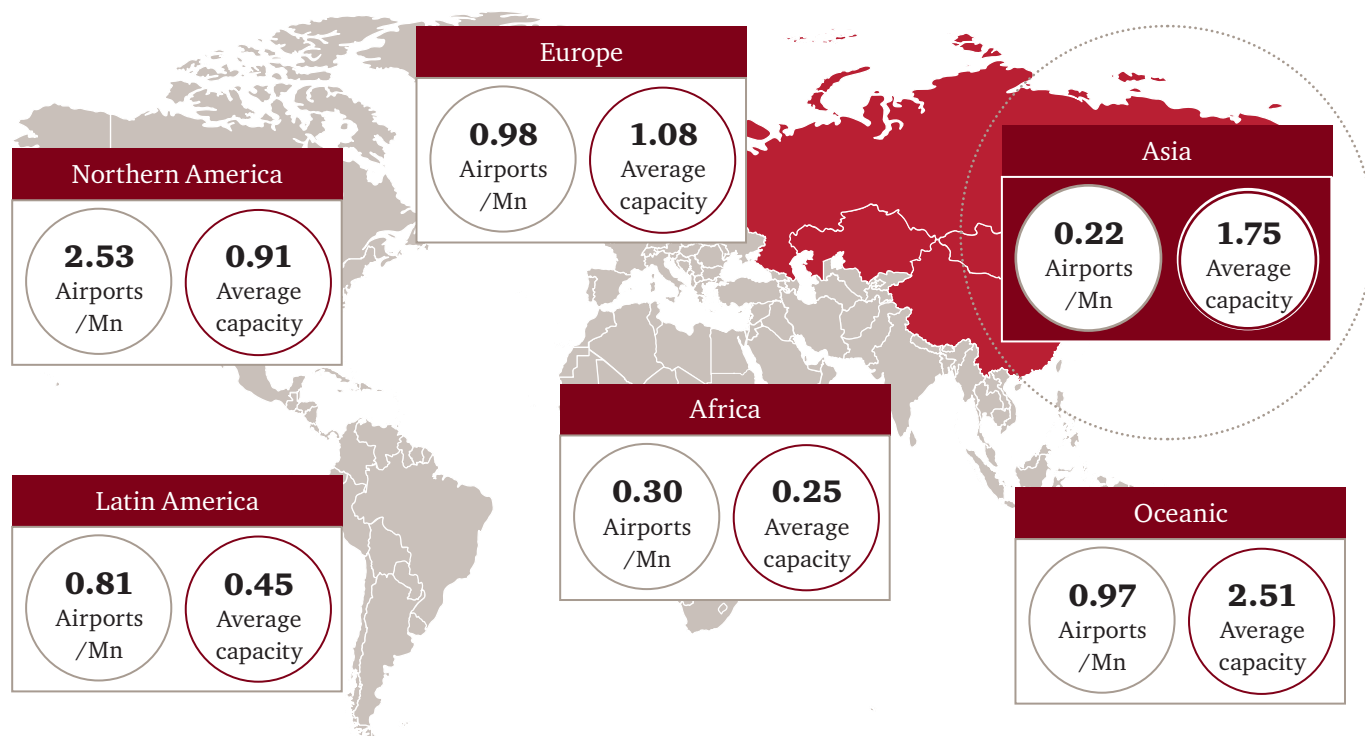
Figure 5: Largest air traffic markets



Source: IATA, ICAO, The World Bank

¹⁷ Markets estimated by total pax of air carriers registered in each respective country

Figure 6: Airports per million inhabitants and average airport capacity in 2013



Note: 'Airports' refers to facilities with a paved runway of at least 5,000 feet in length and scheduled passenger service on commercial airlines.

Source: The World Bank Group, OAG, Airbus, Strategy& analysis

next 10 years. (See Figure 7.) Several mega-hub projects have been announced and are set to come into service in the next decade. Such projects include the Al Maktoum International Airport, Beijing Daxing International Airport, Hong Kong International Airport's Three-Runway System, and Changi's East extension. When finished, each of these is planned to have a capacity of more than 100 million passengers per annum.

Although these mega-hubs appear to solve capacity shortages, construction costs are extremely high, presenting diseconomies of scale in comparison to constructing medium-sized airports. Further, evidence from current airports in Asia shows that even the best-run mega-hubs have not achieved satisfactory operational efficiencies, instead experiencing higher rates of flight delays.

When we study growth trends amongst airports globally, we find that the largest airports have experienced slow rates of growth, appearing to hit a growth wall at the

Asia's main hubs are already under capacity despite being among the largest in the world.

80-100 million passenger level, while the second tier of large airports continues to grow rapidly in terms of passengers served. Given the current inability to manage large Asian hubs efficiently, and the evidence from other regions that airports typically do not grow indefinitely, constructing even larger airports may not be the best approach moving forward.

Optimally sized airports as a solution

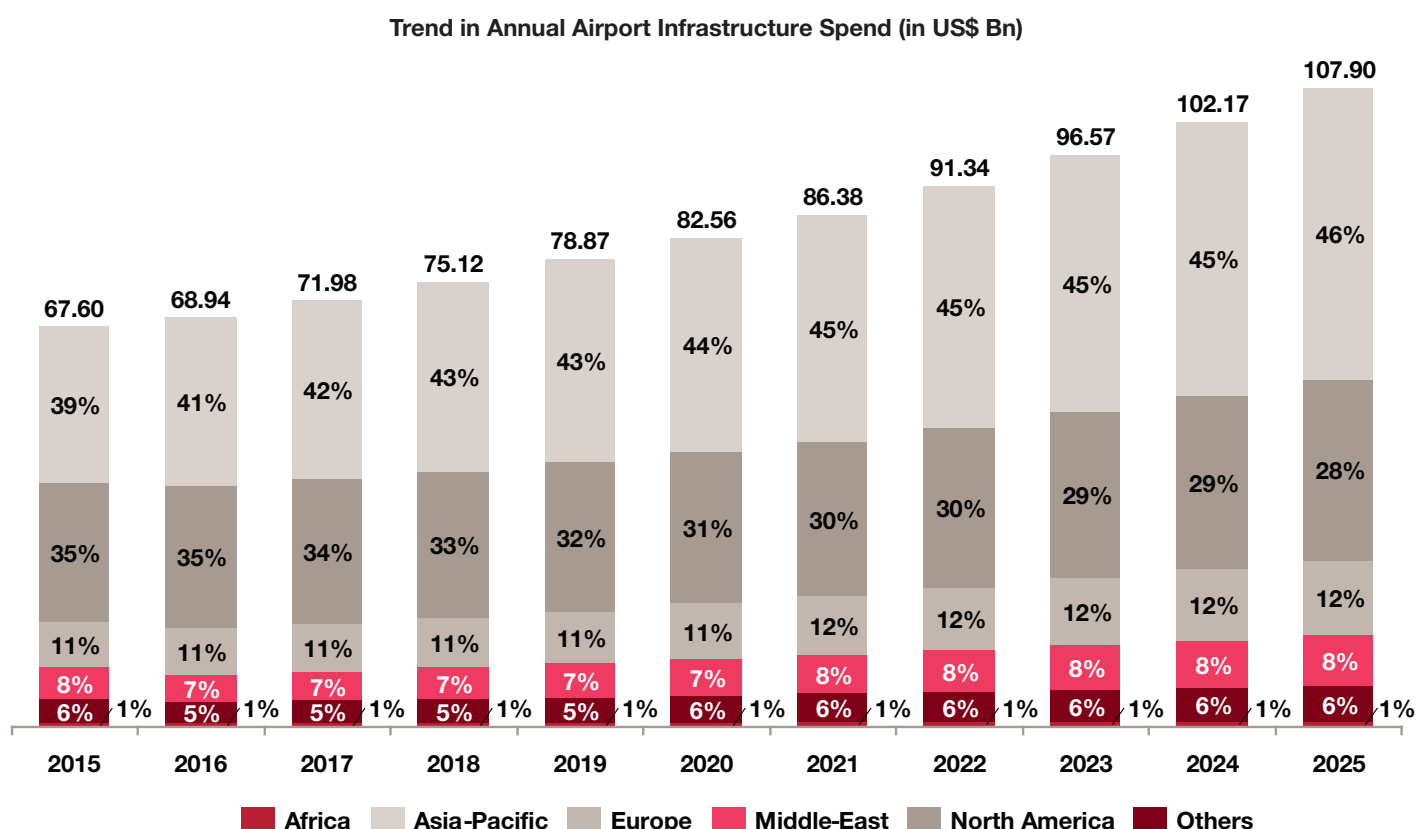
An alternative approach involves the construction of a larger number of optimally sized airports, sufficient as a whole to handle the growth in demand – despite being smaller than mega-hubs. The rationale behind this approach rests on four pillars:

- Delivering airport infrastructure that is cost-effective and efficient, potentially introducing competition for the provision of airport infrastructure

- Providing airport accessibility to a larger percentage of the population, as more airports inevitably means a larger population lives within easy surface travel distance
- Improving the quality of travel, reducing congestion and delays during normal service and weather patterns
- Delivering redundancy in the event of unplanned incidents such as runway closures due to accidents or natural catastrophes

This approach is not new; more than 70 cities or urban areas globally (London, Paris, New York, Chicago, Sao Paulo) are already being served by more than one major airport, with just 15 significant multi-airport systems in Asia (such as Kuala Lumpur, Bangkok, Tokyo, and Pearl River Delta). Regardless of the reasons for multi-airport cities, the benefits appear

Figure 7: Trends in airport infrastructure spend



Source: Oxford Economics, PwC Analysis

clear. Operating several smaller airports is very different from operating a mega-hub with capacities exceeding 100 million passengers per annum, both in magnitude of costs and ease of achieving operational efficiency.

Concerns with multiple airports

The notion of having multiple airports serving a city raises several concerns:

- In some cases (such as Singapore and Hong Kong), it is extremely hard to find space in the city for more than one airport. In these situations, airports in neighbouring territories can provide an alternative (for example, Johor Bahru for Singapore, and Shenzhen, Macao, and Zhuhai for Hong Kong).
- To avoid transfer passengers having to move between airports in a multi-airport city, airports should be planned so that a single airline or alliance can be accommodated in a single airport; transfers between non-alliance airlines are rare.

- Private airport operators may not wish to see a competing airport in the city. It is therefore essential that prior to privatisation, clear policies on multi-airport development are laid out so that the operator has certainty when making the privatisation investment.

Conclusion

Our recommendation is that government policy makers and planners in Asia consider moving beyond simply considering the provision of capacity to meet demand, and instead think through the options for providing a cost-effective travel experience for passengers. Such options should take into account surface travel distance to the airport, time spent navigating the airport (kerbside to aircraft), and operating efficiencies that airlines gain with shorter taxi distances from runway to gate as well as slots that are available to suit passenger and airline schedules. Our expectation is that airports with terminal capacities of 20-25 million passengers and runway capacity of around 50 million passengers (twin independent parallel runways) will

give the optimal combination of scale economy whilst allowing the majority of passengers to travel on point-to-point flights. As such, governments should plan to construct more optimally sized airports with capacities of 20-50 million passengers per annum, rather than mega-hubs exceeding 100 million passengers. In this way, they will stand a better chance of meeting Asia's growing demand in a way that enhances air connectivity and improves the quality of travel.

Note: We have not addressed air cargo in this paper. Because of its nature, air cargo tolerates much longer journey times to airports, and therefore different scale issues arise.

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Has the trend line shifted?

Sector trends and the impact on airport valuations

Romil Radia, Robert Behan, and Christina Franzeskides

Key sector trends – update since November 2014

Key transactions

Investor appetite for airport assets has remained strong over the last 12 months in the UK and continental Europe. A number of high-profile transactions have successfully closed including Heathrow Airport Holdings' (HAL) sale of its interests in Glasgow, Aberdeen, and Southampton airports to a consortium comprising Macquarie and Ferrovial for an EV/EBITDA multiple of circa 16x. The closing of this transaction followed Ontario Teachers' Pension Plan (OTPP) increasing its stake in both Bristol and Birmingham airports. In addition France sold a 50% stake in Toulouse Airport to Symbiose (a Chinese-led consortium) for an implied EV/EBITDA multiple of circa 18x. The deal market remained active in Italy with the sale of Florence Airport achieving an EV/EBITDA multiple of 16.1x.

Key upcoming transactions

Airport transactions are expected to continue hitting the headlines over the coming year. A sale process was launched for London City Airport in mid-2015 with an anticipated EBITDA multiple in excess of 20x being cited in the press. In France it is expected that Lyon and Nice airports will be partially privatised over the coming year on the heels of the successful sale of a stake in Toulouse Airport.

'Strong ongoing interest in the airport sector'

This transaction activity demonstrates that good-quality airport assets are now achieving multiples at the upper end of, and sometimes above, our previously estimated EV/EBITDA valuation range of 14x to 18x for smaller, regional airport assets with good growth potential. We consider it likely that this upward trend will continue into 2016. In our view there are a number of key market developments driving this trend.

Continued passenger growth:

Today's market is characterised by positive growth expectations with a continued increase in passenger numbers across the UK and Europe. For the eight months to August 2015, passenger numbers at UK airports increased 5.6% compared to the same period in 2014. Significant growth has been achieved at a range of key regional airports across the UK including at Birmingham, Manchester, Stansted, and Edinburgh. Across the wider EU area, airports recorded particularly strong growth of 5.1% in the first half of 2015.

Diverse range of investors: Over the last 12 months we have seen airports become increasingly appealing to a broader range of investor types. Both bidders and acquirors of airport assets have

Airports recorded particularly strong growth of 5.1% in the first half of 2015.

included airport operators, financial investors, sovereign wealth funds (SWF), pension funds, and construction companies that all have significant capital to deploy. Often these players form consortia with the aim of boosting value through operational and financial structuring improvements. While traditionally SWF interest in European airport assets has been led by funds from the Middle East and South-East Asia, the last year has seen Chinese players become increasingly active in the European market as evidenced by the Toulouse acquisition. In addition both SWFs and pension funds are now more willing to invest directly into infrastructure assets themselves.

Return expectations: The record low interest rate environment has almost certainly led to a number of investors across the infrastructure sector revising their return expectations. The 20-year UK gilt at

the date of this writing offers a return of 2.4% while the 20-year German bund offers just 1.2%. For the UK, this is below the 2.8% return at the beginning of November 2014 and 5.0% immediately prior to the onset of the financial crisis in mid-2008. Figure 1 demonstrates a similar trend downwards in the rates offered by both the 20-year UK gilt and German bund since 2008. We strongly believe that record low levels of return offered by risk-free assets, which have continued to trend downwards even over the past 12 months, is having a direct impact on the price level at which a number of investors in airport assets are often willing to transact.

Quality airport assets: Linked to investors' return expectations is the class of airport assets that have been garnering most attention. Developments in the past year have strengthened our belief that airport investors have become significantly more selective in

their capital allocation across the sector. The majority of transactions are in key regional or smaller airports that serve a significant catchment area, are faced with limited direct competition, and have a diverse airline base serving the airport. Airport, assets meeting all of these criteria are not widespread and hence generate significant investor attention when they do come to market. A prime example of this is London City Airport, which has carved itself a very lucrative niche in the affluent London area and is expected to achieve a multiple not really seen since the onset of the financial crisis in 2008.

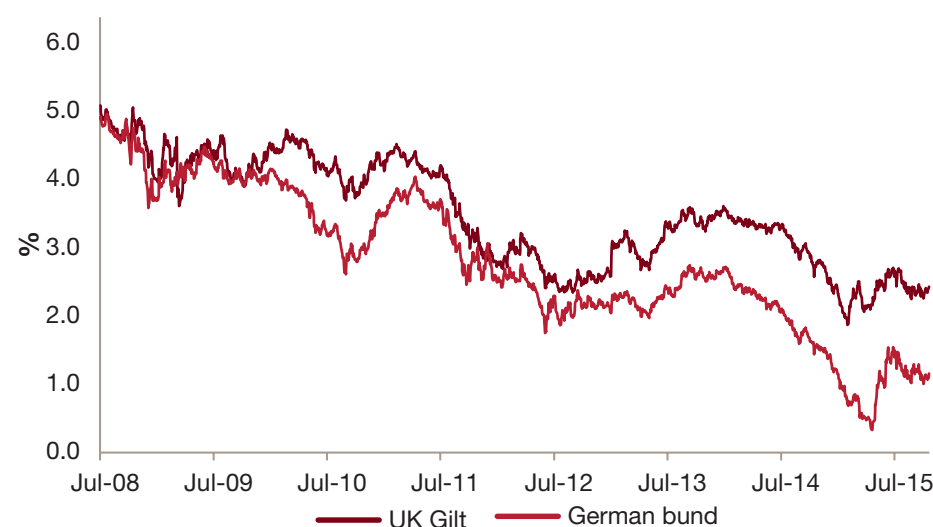
Airports with sufficient scale and airline mix will typically generate more stable cash flows for investors than smaller regional airports with an over-dependence on one or two airlines and which are in direct competition with a larger airport for traffic.

Airports as an asset class

Airports are a unique class of asset. While they have historically enjoyed a moderate degree of cash flow certainty, they have also offered greater potential for growth than more traditional infrastructure assets. However, unlike more traditional infrastructure assets, airports serve airlines as their primary clients and therefore share in the fortunes and woes of a highly cyclical industry. Airport valuations are predicated on expected future cash flows, which are in turn underpinned by passenger demand for travel.

In recent years, EV/EBITDA transaction multiples have for the most part remained in a steady range, with activity in 2015 further supporting this trend. However, despite what we consider to be a more certain growth outlook today than at the time of our previous updates, multiples have yet to show any sign of approaching the upper levels observed immediately before the financial crisis. At that time, against a backdrop of greater availability of credit and

Figure 1: 20-year UK gilt and German bund return



Source: Data stream, PwC analysis

Today's market is characterised by positive growth expectations despite some short-term uncertainties.

sustained passenger traffic growth, we observed multiples for European airports at or above 25x. These were driven primarily by passenger traffic growth forecasts that were based on sometimes unprecedented traffic growth levels continuing uninterrupted for the longer term.

While our outlook for the sector is positive, there still remain some short-term uncertainties. The economic downturn led to a decline in both the number of airport transactions and average EV/EBITDA multiples being paid. Following this, multiple levels achieved have gradually risen and remained broadly steady at a level that now appears at least sustainable in the medium term. However, the ongoing delays of the transaction process for airports in Greece and Italy demonstrate that both sellers and investors remain cautious in certain markets.

Therefore, for the moment we do not expect to see a sustained return of EV/EBITDA transaction multiples to pre-crisis levels that were sometimes in excess of 25x. However, we do anticipate current deal momentum to continue going forward and multiples to be at the very least maintained. Furthermore, given that there is now, in our view, greater visibility around the strength and pace of traffic recovery, observing an upward trend in multiples over the short- to medium-term is possible, particularly if there are asset-specific reasons to justify this.

Uniquely appealing assets

Many investors consider airports relatively safe assets because they typically offer stable cash flows with the potential to realise significant capital gains on disposal. On average, listed European airports have continued to outperform the Eurofirst 300 index over the last six years, having at times enjoyed traffic growth rates in excess of two times GDP growth. (See Figure 2.)

Financial investors in airports such as infrastructure or pension funds are interested in the stable cash flows airports offer. And they often invest with their eye on the long term. Many focus on the internal rate of return (IRR). They also try to enhance value by implementing optimal financing structures.

Trade buyers (such as other airport operators) try to improve operational efficiencies; for example, by increasing commercial yields and by expanding the airport's route network.

UK traffic: Reversion to the trend?

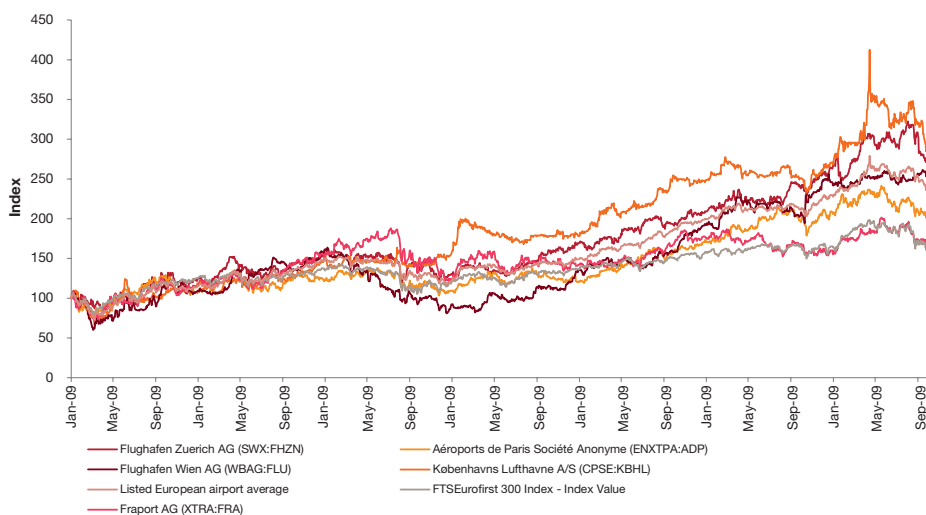
Tracking growth against the trend

The UK market has shown particularly strong growth over the past year, with UK passengers up 5.6% over the eight-month period to August 2015. Against a backdrop of a sustained increase in UK passenger traffic, we explore longer-term trends since 1976 below.

Figure 3 shows UK terminal passenger traffic ("pax") since 1976, with the long-term passenger growth trend superimposed. The graph shows that, up until 2008, it typically took 4-6 years for traffic to return to the long-term passenger growth trend following a recession or other economic shock.

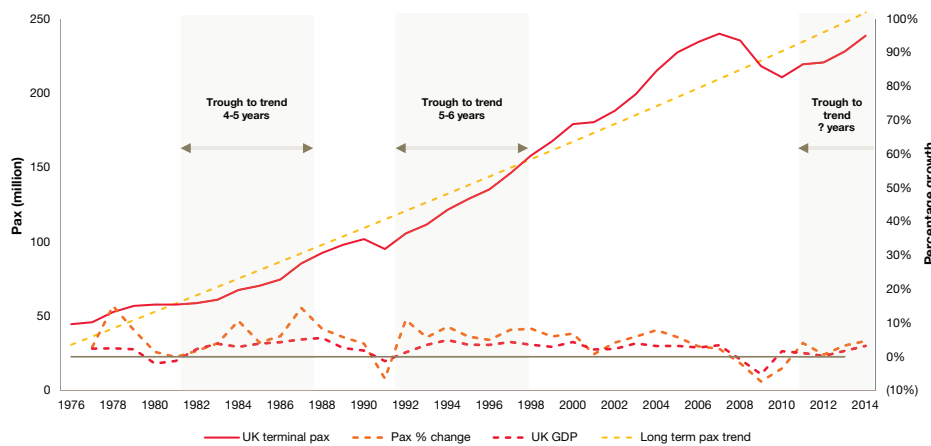
It has often been considered that traffic growth will revert to the long-term trend after a shock rather than grow at a similar rate from a lower base. Indeed, between the late 1990s and mid-2000s, UK traffic saw significant growth above the long-term trend. This was fuelled by a sustained period of economic growth.

Figure 2: Listed European airport share price performance



Source: S&P Capital IQ

Figure 3: UK airport traffic and GDP growth



Source: CAA, DfT, PwC analysis, Press

Growth expectations and transactions

Figure 4 shows actual UK passenger traffic alongside UK traffic expectations in 2007, the last full year prior to the global economic crisis.

In 2007, the expectation was that UK airport traffic would continue growing from its 2007 peak at a rate broadly in line with the long-term growth trend. However, in reality, 2007 passenger growth expectations failed to materialise.

Figure 4 displays the EV/EBITDA multiples between 2000 and 2015 for European airports. Whilst there are obvious challenges in comparing transaction multiples between airports because of each airport's specific operations and individual growth potential, some conclusions can still be drawn. It can be seen that, on average, airport transaction multiples rose in the early to mid-2000s, peaked in 2007, and have fallen since then.

Perhaps unsurprisingly, passenger numbers in the UK have followed a similar pattern. The upshot of this analysis is relatively straightforward: transaction multiples are a function of current earnings and expectations for future earnings growth, with the simple relationship being that the greater the growth potential, the higher the multiple.

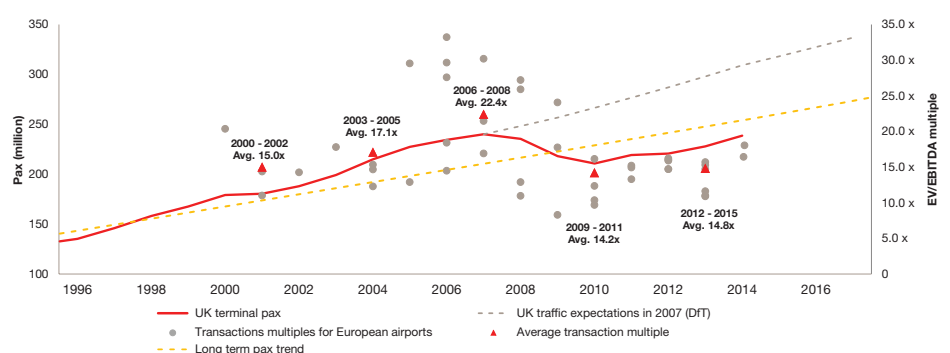
In 2006-2008, observers expected long-term passenger traffic to continue growing at the rates seen in the immediate preceding years rather than to revert to the long-term trend as they anticipated a one-off upward shift in the long-term traffic trend. These expectations were reflected in increasingly higher transaction multiples paid during that period. However, once investors realised that the expected growth was unlikely to materialise, and coupled with the tightening of credit markets, transaction multiples declined.

Over the past three years we have seen average transaction multiples stabilise at around 14x to 16x EV/EBITDA. Recent UK traffic data suggests that future terminal passenger growth may follow this revised long-term traffic trend.

Furthermore, there have been encouraging signs on the UK economic front. Based on the latest data released in April 2015, the IMF has kept its UK short- and medium-term GDP forecasts steady following an upgrade to these forecasts at the end of 2014. The more subdued Eurozone GDP forecasts have remained broadly unchanged over the period, with economic fundamentals remaining a key concern across the region.

Despite the maintained GDP growth forecasts for the UK and the positive outlook for strong airport assets with passenger scale, some smaller regional UK airports remain vulnerable. This is because of the shift in the balance of power to low-cost carriers, which have become increasingly mobile and can relocate their operations at short notice.

Figure 4: UK airport traffic and European transactions



Source: CAA, PwC analysis

What influences an airport's value?

The two main approaches to airport valuation are Discounted Cash Flow analysis and Transaction Multiples, which are discussed in turn.

Discounted Cash Flow Analysis

– While transaction multiples provide useful valuation benchmarks, typically the discounted cash flow (“DCF”) valuation methodology is used as the primary approach to value airports. This is because airports generally have long-term projections that offer cash flow visibility. The DCF approach is also more appropriate for differentiating between an airport's revenue streams (aviation, retail, real estate, external operations) and the various regulatory mechanisms under which airports operate.

Airport Transaction Multiples

– There are clear challenges in comparing transaction multiples between airports. This is due to each airport's specific operations and individual growth prospects. In addition to market factors and competitive bidding conditions at sale, key factors impacting airport value and transaction multiples include the following:

- **Maturity of the airport.** Most large, mature airports have less potential to increase traffic than smaller regional airports and may trade at a lower multiple. For a small regional airport starting from a low passenger base, attracting two or three new airlines can transform the business – a prospect that is often reflected in transaction multiples. Conversely, larger airports tend to have a broader airline base, so they are less vulnerable to customer concentration risk and volatility.
- **Potential for yield improvements.** Airports with non-aeronautical revenues that are lower than those of comparable airports can boost their earnings by improving their retail offerings, increasing parking fees, and making other similar enhancements. This potential for better earnings can also be reflected in transaction multiples. However, benefiting from an enhanced non-aeronautical revenue stream can require significant capital expenditure investment.

- **Regulatory environment.**

Airports are typically subject to regulation when regulators see them as holding substantial market power. Regulated airports' risk/reward profile differs from those of unregulated airports. For example, investors see regulated airports as more vulnerable to changes in regulatory regimes, increasingly regulatory risk. Airports are also subject to different regulatory environments in different jurisdictions. In the UK, for instance, regulated airports are allowed to earn a return on their regulated asset base (RAB). RAB is therefore a key valuation metric, and the market places significant emphasis on enterprise value to RAB multiples in assessing the value of regulated airports.

- **Catchment area penetration.**

The extent to which an airport has penetrated its primary and secondary catchment areas affects its passenger growth potential.

- **Capacity constraints.** Runway or terminal capacity constraints tend to depress an airport's traffic growth potential. Alleviating these constraints may require significant capital expenditure spend as well as planning and regulatory approval.

- **Airport traffic mix.** The make-up of an airport's traffic – the mix of short- and long-haul as well as business, leisure, charter, and low-cost traffic – affects airport earnings. For example, traffic mix can strongly determine an airport's commercial revenue spend per passenger. Domestic passenger retail spending will tend to be lower than that of leisure travellers (e.g. charter), owing to shorter airside dwell time. Business traffic is a lucrative revenue stream given it will likely stay steady during an economic slowdown, compared to other traffic types such as charter.

- **Airline customer dependence.**

The degree of airline concentration at an airport will impact value. If an airport is highly dependent on one or two key airline customers, a reduction in aircraft capacity (due, for example, to reallocation of aircraft capacity across an airline's network or airline bankruptcy) will have a material

impact on the airport. Further, airports typically have to renegotiate tariff increases on a frequent basis with their main carriers, and single airline dominance at an airport will affect the balance of negotiating power in favour of the airline.

- **'Stickiness' of airlines.** The extent to which an airline has the option to relocate operations to another airport that serves the same catchment area will determine the stickiness of an airline to a particular airport and will impact value. Stickiness subsequently determines the balance of negotiating power in tariff negotiations (i.e. the extent to which tariffs can be increased without significant adverse effects of the airline moving its operations away from the airport). It is difficult to isolate the impact of airline stickiness in a transaction multiple. However, we have observed adverse effects through the suppressed EBITDA margin of airports that do not have strong power in price negotiations with airlines.
- **Cyclicality.** The extent to which the above factors are relevant to a given airport is likely to determine cash flow volatility. Therefore cyclicality should be built into long-term cash flow projections. When assessing the value of an airport it is essential to recognise the cyclicality of the industry by considering where we currently sit in the economic cycle and building sensitivities into cash flow projections to reflect economic downturns and other risks. Recent evidence suggests that airport performance is not as immune to wider market volatility as perhaps once thought.
- **Dividends.** The history that an airport has demonstrated in paying regular dividends and the potential capacity to continue paying these regular dividends will influence value. Given that airport investors often invest with their eye on the long term, the prospect of regular dividend payments will enhance investors' views around the liquidity of the investment. Airports also offer the flexibility of being able to support dividend payments during a slowdown through the deferral of operating costs and the rescheduling or reducing of capital expenditure.

Given the number of circumstances affecting an airport's value, investors need to carefully assess airports' comparability and adjust transaction multiples where appropriate.

Where do we go from here?

We expect to see significant deal activity to continue into 2016 and beyond, particularly in the UK and European markets where an increasing range of investors are likely to take confidence from the enhanced visibility into passenger growth. Investors are likely to be selective in seeking out airports best positioned to capitalise on this expanding passenger market.

Given current market evidence, we expect to see transaction multiples to be at the very least maintained, if not to edge upwards, over the short term. We would expect higher growth regional airports to transact within a range of at least 14-16x times EV/EBITDA, and larger more mature airports in a range of 10-14x EV/EBITDA.

Airports demonstrating sustainable growth with good visibility over the strength and pace of passenger growth could even transact towards the higher end of these ranges. As can be seen in Figure 4, airport transaction multiples have perhaps at the very least stabilised,

while recent passenger growth trends above the rates seen in 2014 could be a catalyst for higher multiples.

While we do not expect to see an immediate return to the +20x transaction multiples observed in the mid-2000s, the greater visibility into the strength and pace of traffic recovery now afforded to investors in the UK and certain parts of Europe does not preclude seeing an exceptionally high multiple achieved for an airport, if there are asset-specific reasons to justify this.

Once an airport transaction has been completed, it clearly provides a useful valuation benchmark. However, 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, or even unrealistic, growth expectations.

With regard to longer term passenger trends, the speed at which traffic may return to the long-term trend line hinges on the pace of economic recovery.

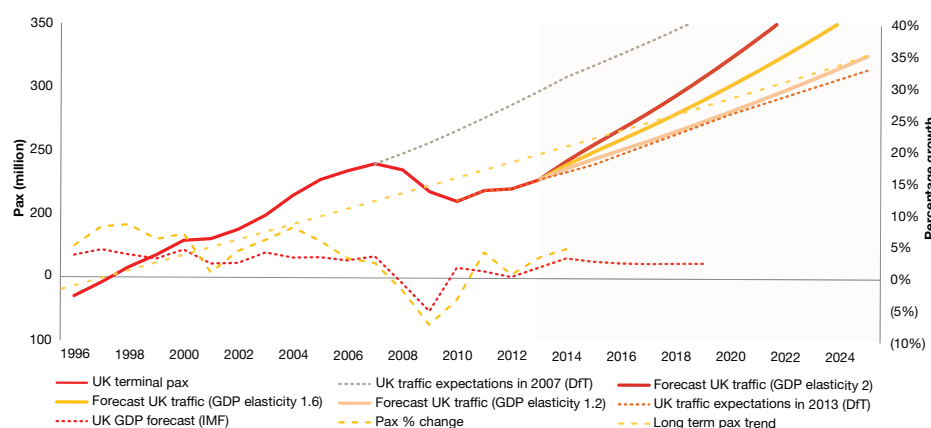
Figure 5 sets out current passenger number expectations for the UK aviation market, but also projects a range of potential passenger growth profiles based on forecast UK GDP growth and a range of income elasticities.

In Figure 3, we saw that in the early 1980s and 1990s, it took four to six years for traffic to revert to the long-term trend after an economic slowdown.

The patterns in Figure 5 suggest that even in a high-growth scenario, passenger numbers are unlikely to revert to the trend line before 2022-2024.

Given that the drop in UK passenger traffic since 2007 has been markedly sharper than that observed in previous periods of economic recession, a 7-9 year period for reversion to the long-term trend appears somewhat likely. Indeed if one were to focus on lower passenger growth profiles, it could be argued that the long-term trend line is shifting downwards and that the premise that traffic always reverts to long-term historical trends must be questioned.

Figure 5: UK airport traffic – reversion to trend



Source: CAA, DfT, IMF, PwC analysis

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