

SLOT SCARCITY AND TICKET PRICES AT HEATHROW

A report prepared for Heathrow

01 JUNE 2022

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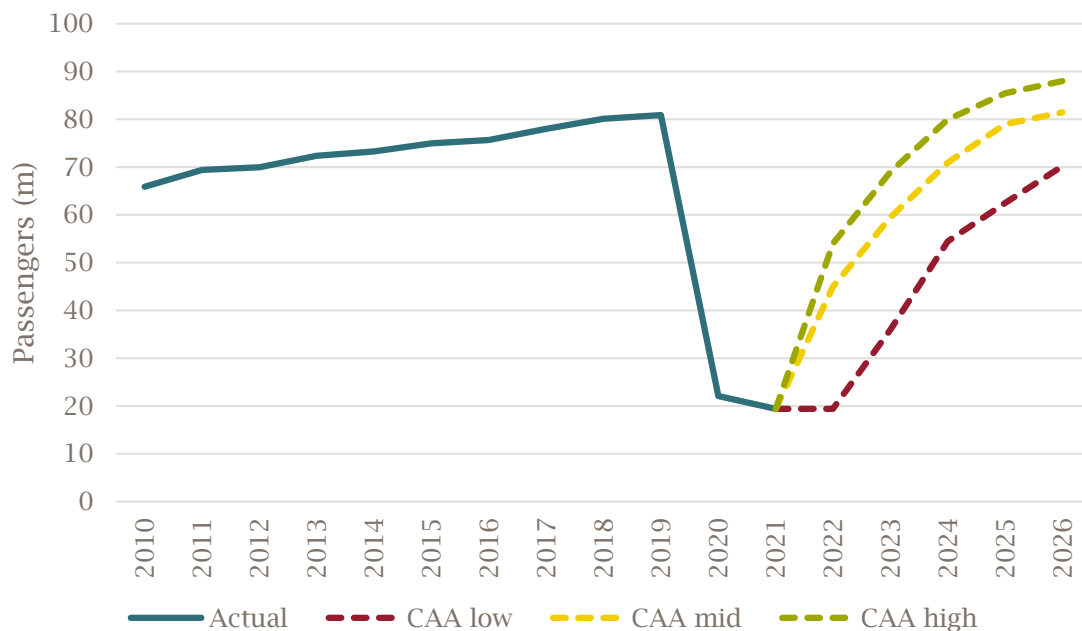
EXECUTIVE SUMMARY

BACKGROUND AND INTRODUCTION

Heathrow’s airport charges – i.e. the charges paid by airlines to use Heathrow’s infrastructure and airport services – are regulated by the CAA. The CAA is currently in the process of determining Heathrow’s maximum allowable yield per passenger for the H7 period, which covers 2022-2026.

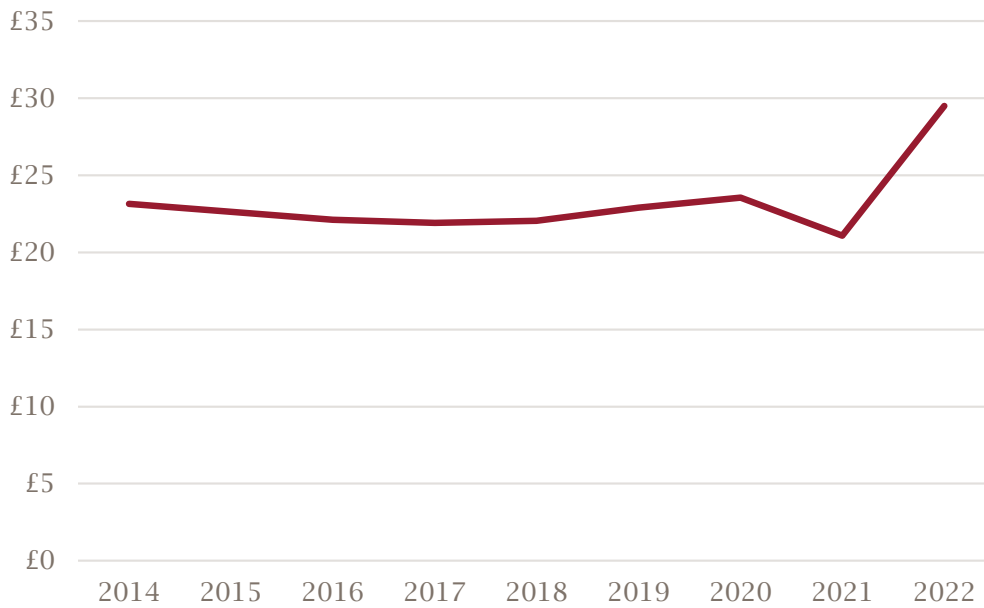
The key issue at the heart of the H7 price control is Covid-19. The pandemic has had an unprecedented impact on the aviation sector. Prior to the pandemic, Heathrow handled around 80 million passengers per annum. This fell to around 20 million passengers (-73%) in 2020. Since then, the sector has seen a slow and uneasy recovery, and the future is extremely uncertain. While the CAA has produced passenger forecasts out to 2026, there is no precedent for these circumstances and so all forecasts need to be viewed with considerable caution. We note that, unsurprisingly, there is a very wide range in the CAA’s forecasts.

FIGURE 1 PASSENGER VOLUMES AT HEATHROW FELL BY MORE THAN 70% IN 2020 RELATIVE TO 2019



Source: Frontier analysis of Heathrow and CAA data from the Initial Proposals

In this context, the task of determining a reasonable level for Heathrow’s airport charges is extremely challenging. For 2022, the CAA has made an interim decision that Heathrow is allowed to charge airlines up to £30 per passenger on average. This equates to an increase of around 40% relative to charges in 2021. As noted by the CAA, “the upward pressure on prices in this period is driven primarily by lower forecast passenger numbers rather than a material and sustained increase in operating and capital costs”. In other words, while Heathrow can be expected to downsize a proportion of its operating costs in response to lower volumes, a large proportion of its costs (including its allowed return and depreciation on existing assets) are essentially fixed, which, when recovered over a smaller number of passengers, will result in higher average costs.

FIGURE 2 HEATHROW'S MAXIMUM ALLOWABLE YIELD PER PASSENGER

Source: Frontier analysis of Heathrow's annual charges consultations

Airlines at Heathrow have voiced serious concerns about this price increase:

- Heathrow's airport charges are unreasonable: Willie Walsh, Director General of IATA and former CEO of IAG and BA called Heathrow a "greedy monopoly hub" and said the increase in airport charges was "outrageous".¹ He also called on the UK's Secretary of State to intervene.²
- Airport charges will lead to higher ticket prices: airlines have argued that these higher airport charges will be passed through to passengers in the form of higher ticket prices. For instance, Virgin Atlantic has been reported as saying the increase in airport charges adds up to £200 to the cost of a family trip to Florida.³
- Route viability will be impacted: BA has raised the possibility of reducing its capacity at Heathrow, with IAG's CEO reported as commenting that "if the rise in landing charges goes ahead, I know IAG will not be alone in reconsidering our airlines' use of Heathrow".⁴

We have been commissioned by Heathrow to review these concerns.⁵

¹ <https://www.reuters.com/business/aerospace-defense/head-world-airline-group-blasts-heathrow-plan-higher-fees-2021-10-13/>

² <https://www.telegraph.co.uk/business/2021/12/16/heathrow-cleared-increase-charges-seven-times-rate-inflation/>

³ <https://www.dailymail.co.uk/news/article-10316473/Heathrow-passengers-pay-30-airport-charges-adding-200-cost-family-trip-Florida.html>

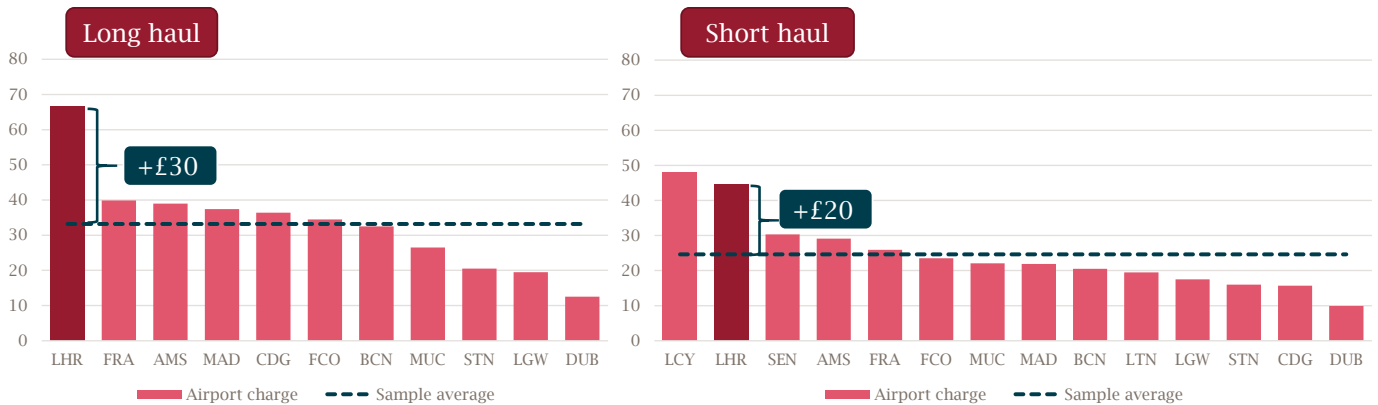
⁴ <https://www.independent.co.uk/travel/news-and-advice/british-airways-heathrow-airport-charges-b1962704.html>

⁵ This report was written before the CAA published its Final Proposals. However, despite the updates between the Initial Proposals and the Final Proposals, the high level findings still hold.

HEATHROW'S CHARGES ARE HIGH, BUT THEY ARE REGULATED AND DESIGNED TO BE COST-REFLECTIVE

A high level comparison of airport charges at Heathrow with those at other London airports and large European hubs confirms that Heathrow's charges are indeed high in comparison to those at other airports. The chart below is based on data on airport charges from 2021, and does not yet capture the c40% increase in charges at Heathrow in 2022, but it is clear that Heathrow does have high charges compared to other airports.

FIGURE 3 AVERAGE CHARGE PER DEPARTING PASSENGER (2021, GBP)



Note: The figures above are based on how much it would cost - on a per departing passenger basis - to operate representative airline turnarounds at each of the airports in the sample based on their publicly available airport charges. This was based on assuming a A320 for short haul operations and a B777 for long haul operations, which are BAs most common aircraft types for short haul and long haul respectively, and various other assumptions on aircraft parking and load factors etc.. We note that the results do change if we were to change those operating assumptions. However, under all reasonable assumptions, the general picture above remains - i.e. Heathrow being most expensive for long haul and generally expensive for short haul. Heathrow's maximum yield per passenger figures reported earlier relate to how much Heathrow can charge per passenger. However, in practice, airports generally charge airlines as they depart the airport only and not as they land. Therefore, the charge per departing passenger is generally twice as high as the average revenue per passenger.

Source: Frontier analysis of Apex data

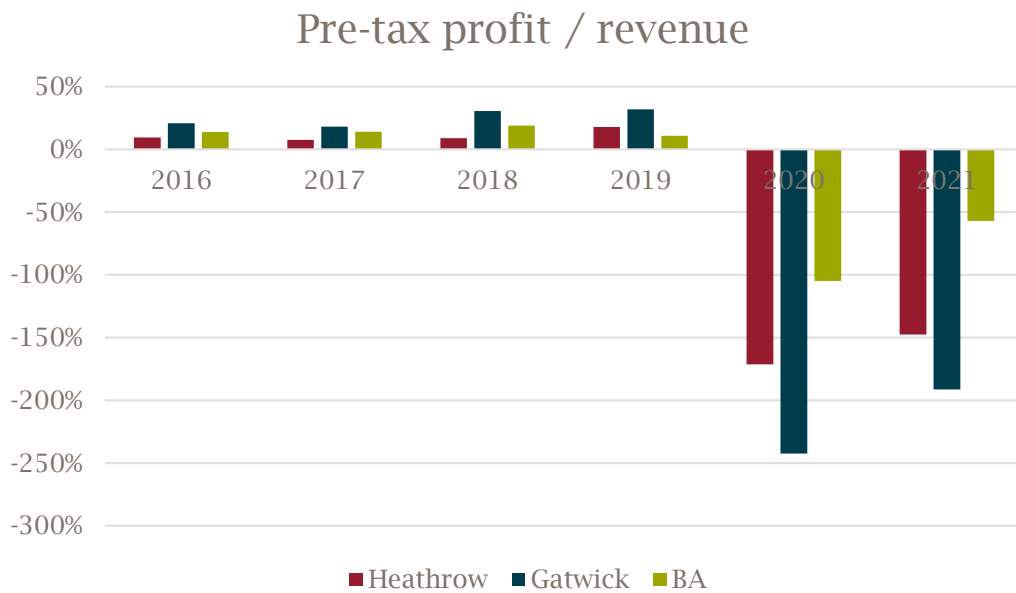
However, when discussing airport charges at Heathrow it is important to recognise that its charges are regulated by the CAA and are designed to be cost-reflective - where the CAA's forward-looking view on cost also includes an efficiency challenge. In carrying out its duties, the CAA's primary purpose is to "further the interests of users of air transport services regarding the range, availability, continuity, cost and quality of [airport services]", whilst ensuring that Heathrow does not find it unduly difficult to finance itself.⁶ The CAA has also commented that "it is also vital for consumers that airport charges raise sufficient revenue to allow HAL [Heathrow] to provide an appropriate level of service and finance new investment, including the capital spending necessary to keep the airport safe and secure."⁷

This regulation limits Heathrow's ability to generate profits in excess of its cost of capital. The chart below highlights that, before the pandemic, Heathrow reported relatively modest levels of profitability - lower than those at Gatwick and generally lower than those at BA too. All three businesses made significant losses in 2020 and 2021 due to Covid-19.

⁶ <https://www.legislation.gov.uk/ukpga/2012/19/part/1/chapter/1/crossheading/general-duties?view=plain>

⁷ [https://publicapps.caa.co.uk/docs/33/CAP2265A%20H7%20Summary%20\(p\).pdf](https://publicapps.caa.co.uk/docs/33/CAP2265A%20H7%20Summary%20(p).pdf)

FIGURE 4 HEATHROW'S PROFITABILITY



Source: Frontier analysis based on annual reports

The CAA has published extensive documentation on how it derived Heathrow’s maximum allowable yield per passenger for 2022, which included commissioning a number of expert reports. Therefore, given Heathrow’s charges are regulated and cost-reflective, benchmarking is arguably not particularly relevant and the results need to be interpreted with caution. All airports are different and there is no reason why charges should be the same across different airports when they operate in very different conditions.⁸

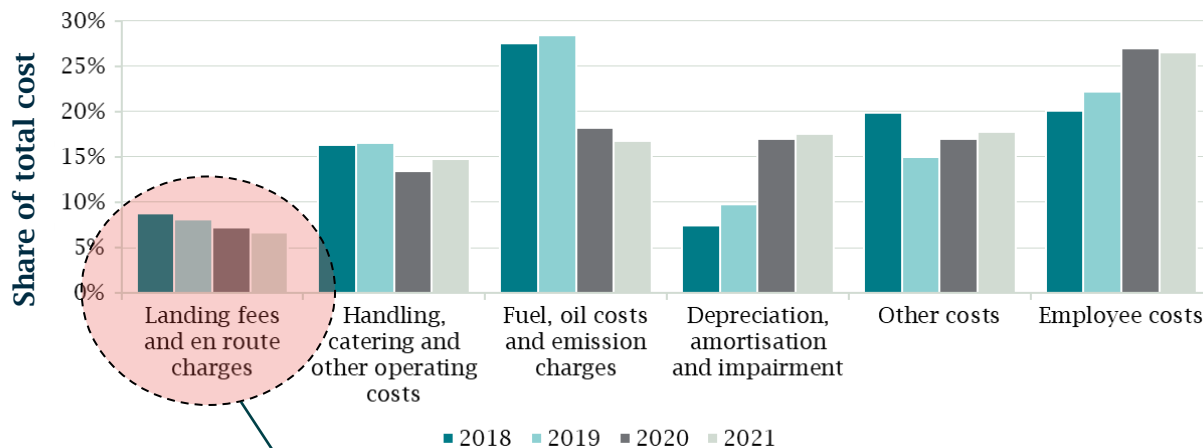
IT IS NOT CLEAR THAT HIGHER AIRPORT CHARGES AT HEATHROW WILL BE PASSED THROUGH TO PASSENGERS

AIRPORT CHARGES ARE ONE COMPONENT OF AN AIRLINE’S OVERALL COST STRUCTURE

Airport charges need to be placed in context as one component of an airline’s overall cost structure, alongside other larger cost items which have also seen large increases in inflation since the start of the pandemic. Analysis of BA’s annual reports suggests that, prior to the pandemic, Heathrow’s airport charges represented around 2.5%-5% of total operating costs. Therefore, the increase in Heathrow’s airport charges in 2022 equates to an increase of around 1%-2%, relative to BA’s operating costs pre-pandemic. This is shown below.

⁸ Explaining why Heathrow’s airport charges are higher than those at the other airports in our sample was not in the scope of this project. However, we would note that (i) Heathrow is located to the west of London where land values and labour rates are particularly high, which can be expected to put an upwards pressure on opex and capex / depreciation; (ii) Heathrow is recognised as having high levels of service quality – e.g. since 2011, Heathrow has appeared in Skytrax’s Top 20 ‘best airports in the world’ for service quality, outperforming the other London airports in all years; and (iii) Heathrow is a large, complex, hub airport – and the largest airport in Europe – which means it is not particularly comparable to some of the other airports in the sample.

FIGURE 5 ANALYSIS OF BRITISH AIRWAYS' ANNUAL OPERATING COSTS



This includes ATC costs as well as airport charges at other airports. So Heathrow's airport charges represent around less than half of this total – i.e. c2.5%-5% of BA's total costs. Therefore, a c40% increase in Heathrow's airport charges would represent a 1%-2% increase in total costs

Source: Frontier summary of BA annual reports

However, this is dwarfed by the increases in fuel costs and labour costs observed over the same period. Since 2019, fuel costs – which represented around 25%-30% of BA's total operating costs pre-pandemic – have increased by nearly 90%⁹ and labour costs – which represented around 20%-25% of total operating costs – have increased by around over 12%¹⁰. BA has even been reported as offering new cabin crew a £1,000 'golden hello' as it struggles to recruit workers.¹¹ This is not to suggest that the increase in airport charges is not material or important. But it casts doubt over whether the movement in airport charges at Heathrow can really be singled out as driving negative outcomes in the sector, especially when those charges are regulated and designed to be cost-reflective.

In fact, the CAA also commented that “it is important to note that airport charges typically represent a relatively modest proportion of the air fares at Heathrow and so they would create a very significantly smaller percentage increase in the overall cost of travel.” (However, this final point makes some implicit assumptions about cost passthrough which we discuss below.)

COST PASSTHROUGH AT HEATHROW CANNOT BE ASSUMED

First, in the airline sector, there is not a *direct* link between cost and price. Airlines set capacity (i.e. frequency and seats on a particular route), and then the market sets the price. If there is an abundance of spare capacity on a given route, ticket prices will fall. Conversely, if demand turns out to be higher than anticipated, and seats become scarce, ticket prices will rise. This is why in the airline sector we typically see higher prices at peak times of the day and the year, and even passengers on the same flight paying different prices, even though underlying costs do not necessarily vary as much, with profitability assessed over the course of a season or year. There is less focus placed on profitability at the level of individual flights.

⁹ This figure relates to the increase in European jet fuel prices from the 31/12/2019 until the 21/04/22 (the most up to date figures at the time of writing). Underlying data is sourced from Bloomberg, European Jet FOB Rotterdam Barge Spot.

¹⁰ Increase in UK median pay from December 2019 to March 2022, sourced from Pay As You Earn (PAYE), HMRC.

¹¹ <https://www.bbc.co.uk/news/business-61104230>

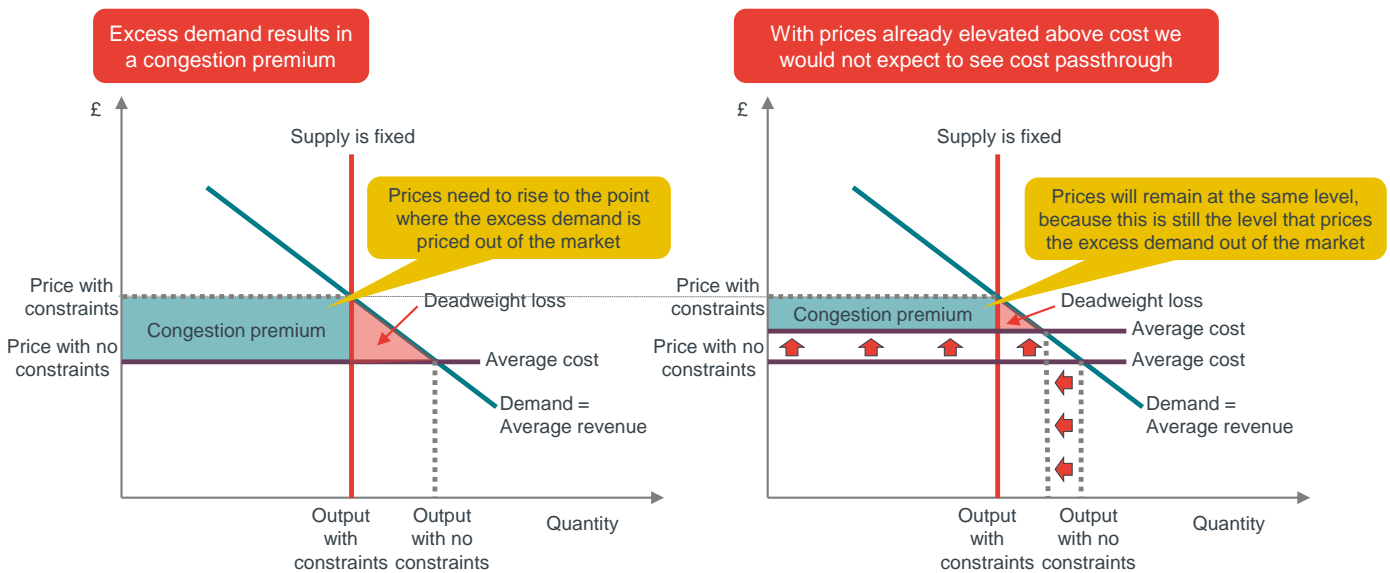
COST PASSTHROUGH WITH NO BARRIERS TO ENTRY

In a competitive market with no barriers to entry we would expect airlines to earn normal levels of economic profit on individual routes. (Importantly, barriers to entry in the context of airline competition relates to the availability of take-off and landing slots at airports, which we discuss below.) Airlines adjust capacity on routes in response to changes in cost to the point where prices reflect the long run marginal cost of providing the service, such that any increase in cost would indeed be passed through to end consumers.

COST PASSTHROUGH WITH BARRIERS TO ENTRY

In a market with capacity constraints or barriers to entry, airlines are able to set ticket prices above cost, at the level necessary to price the excess demand out of the market.¹² This increase in price above cost is known as the ‘congestion premium’ (or ‘scarcity rent’). This dynamic also occurs in many other markets – including the housing market, hotels, and tickets for major events. When prices are already elevated above cost we would not necessarily expect to see any cost passthrough – unless the increase in cost was greater than the premium. This is illustrated below.

FIGURE 6 WHEN THERE ARE BARRIERS TO ENTRY, TICKET PRICES ARE EXCESSIVE AND UNRELATED TO COST



Source: Frontier illustration

On the one hand, this protects passengers from cost increases, as the cost is effectively borne by the airline instead. However, clearly this only arises because passengers were already paying a premium above cost in the first place.

In our previous work for Heathrow, we highlighted that, before the pandemic, Heathrow had been full since the mid-2000s, with virtually no available slots at any time of day or year. We estimated that this resulted in a congestion premium at Heathrow worth around £2 billion per annum in additional revenue to airlines,

¹² We note that simply being full does not result in a premium. There also needs to be differentiation, otherwise any increase in price would simply result in passengers (and airlines) switching to other airports. There are many reasons to believe that Heathrow does have this level of differentiation – e.g. location, service quality, long haul, and hub-and-spoke operations – and ultimately the CAA has determined that Heathrow has significant market power which is why Heathrow’s airport charges are regulated.

equal to around a 20% premium on ticket prices.¹³ To put this figure into perspective, before the pandemic, Heathrow’s total allowed aeronautical revenue (i.e. the CAA’s determination on the maximum allowable yield per passenger multiplied by its passenger forecast) was in the order of around £1.6 billion per annum. In other words, the ticket premium at Heathrow was larger than the combined airport charges paid by airlines at the airport.

This in part explains why airlines were prepared to pay significant sums to buy slots from incumbent airlines at Heathrow, when there were slots available ‘for free’ at other London airports.¹⁴

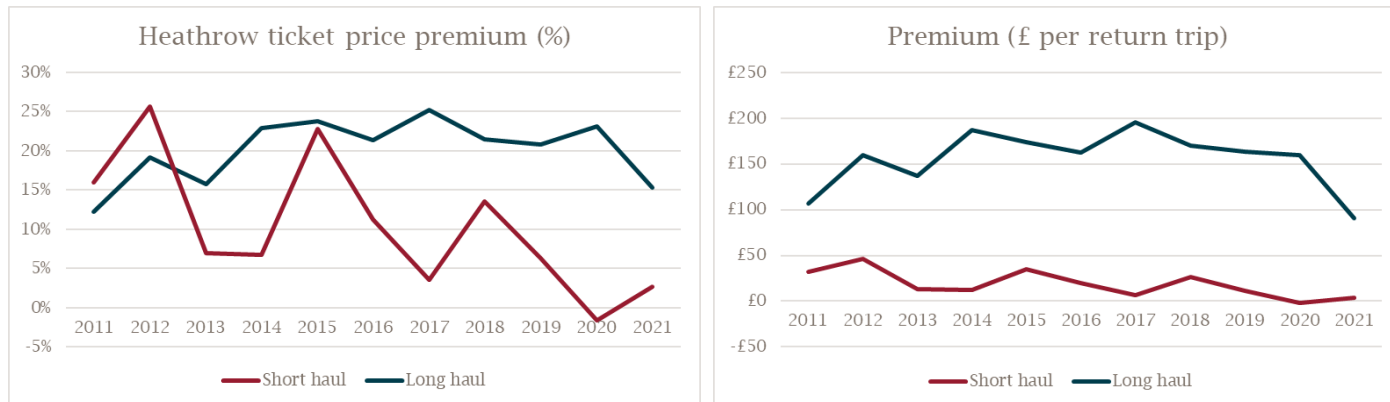
In 2019, the CAA accepted that there was a premium at Heathrow, noting that “we consider that it is likely that some airlines are earning scarcity rents [a congestion premium] at Heathrow” and argued that assuming a premium in the range of “£0.9 billion-£2.5 billion per annum” was “conservative”.¹⁵

COST PASSTHROUGH SINCE THE START OF THE PANDEMIC

In the current context, one might expect that there could no longer be a *congestion* premium at Heathrow, as the airport is operating well below maximum capacity. However, the way that slots are allocated means that access to slots at Heathrow remains a barrier to entry for new airlines wishing to operate there, or for incumbent airlines wishing to increase their operations.¹⁶

We have updated our empirical analysis comparing ticket prices at Heathrow with those at comparator airports, and we still find evidence of a premium in 2020 and 2021 (data on prices in 2022 was not yet available at the time of the analysis). This premium might better be described as a ‘slot scarcity’ premium.

FIGURE 7 WE STILL FIND EVIDENCE OF A PREMIUM AT HEATHROW



Source: Frontier analysis

¹³ <https://www.caa.co.uk/media/dwfgyk53/estimating-the-congestion-premium-at-heathrow.pdf>

¹⁴ For instance, Oman Air bought a daily pair of peak slots at Heathrow for a record \$75 million in 2016. <https://www.thetimes.co.uk/article/oman-breaks-heathrow-record-with-deal-for-slots-5mhdz23mn>

¹⁵ <https://publicapps.caa.co.uk/docs/33/CAP1871%20Early%20expansion%20costs%20condoc%20v1.6.pdf>

¹⁶ For instance, easyJet – which is not present at Heathrow – has publicly stated on many occasions that it would like to enter Heathrow if it were possible. And in the event of expansion at Heathrow it has set out its ambitions to enter, adding capacity onto existing connections (which would reduce prices on those routes) and to add new connections too. <https://corporate.easyjet.com/~media/Files/E/Easyjet/pdf/about-easyjet/easyJet-response-to-the-airports-commission-consultation-jan2015.pdf>; <https://www.independent.co.uk/travel/news-and-advice/easyjet-flights-heathrow-gatwick-slots-b1724885.html>

Similarly, Virgin Atlantic has commented that “We have 5% of the slots and we want 15%. There are 18.5 million passengers at Heathrow flying on monopoly routes who could have lower fares.” <https://www.theguardian.com/business/2019/oct/23/heathrow-accuses-ba-acting-against-uk-consumer-interests>

- For long haul, we have found evidence of a premium of around 15%-23% for 2020 and 2021. This equates to around £90-£160 for a passenger making a return trip. This finding controls for various factors that impact on price – such as fuel costs, share of LCCs, share of business class – as well as the higher airport charges at Heathrow.
- For short haul, in 2020 and 2021 we do not find strong evidence of a premium once we control for other factors, including the higher airport charges at Heathrow. However, as set out below, the premium may re-establish itself once demand returns back to more ‘normal’ levels.

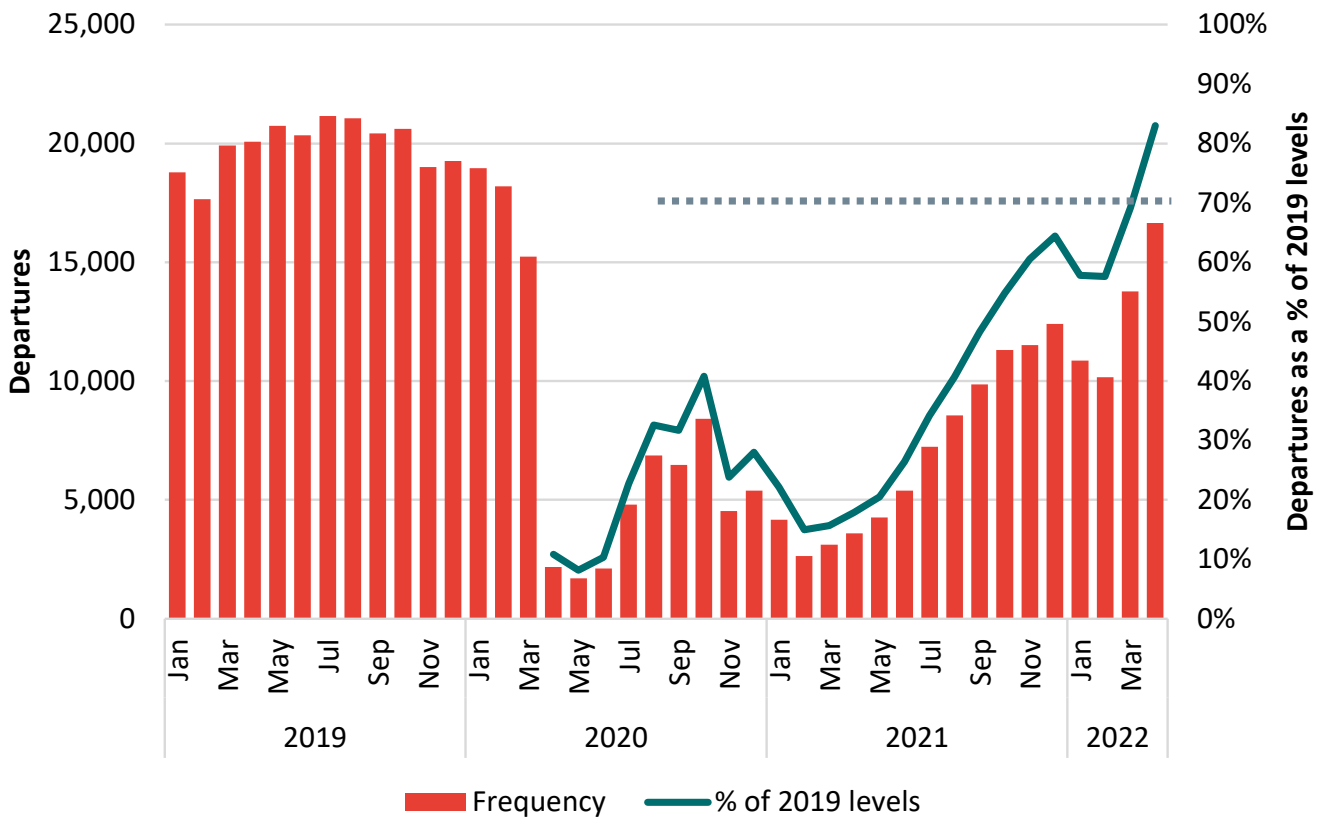
However, we would urge caution when interpreting the results for 2020 and 2021. Ticket prices are ultimately determined by the balance between supply and demand, and clearly 2020 and 2021 were particularly unusual years for the sector, and prices in these years may not tell us much about the future.

From the airlines’ perspective, there is an important point around timing and expectations around profitability over the medium term, rather than in just individual years. Even if there was no evidence of a premium at all in 2020 or 2021, if airlines anticipated that demand would return back to ‘normal’ levels, and the premium with it, they would be prepared to continue operating at Heathrow even at a loss in the short term in order to hold onto their slots and continue to earn the premium again in future. And there is clear evidence that this is happening.

It is important to note that a new ‘70/30’ slot allocation rule has also come into effect in the UK for the Summer 2022 season (starting at the end of March). This means airlines at Heathrow will be forced to increase their capacity and use their slots 70% of the time, or risk losing their slots. In Q1 2022, airlines were generally operating below this level. However, in April 2022 (when the new rules came into effect), the number of departures at Heathrow was at 83% of the level in April 2019, suggesting that airlines are indeed increasing capacity to protect their slots. Airlines have the option to walk away from Heathrow and lose their slots, but even though demand and profitability is uncertain, we are not seeing evidence of this.¹⁷

¹⁷ Since the start of the pandemic, BA has reduced its presence at Gatwick, with some media reports suggesting that this is to focus its operations at Heathrow in order to help protect the value of its slots there. IAG’s CEO commented that “Gatwick is an important decision that we need to take as a group. It’s true that we have the issue with the slots... Gatwick has some strategic value, but we need to be competitive there. This crisis is going to change the profile ... of the demand. So we are analysing the different options.” <https://www.airportwatch.org.uk/2021/06/british-airways-might-abandon-gatwick-for-heathrow-if-80-slot-use-rules-are-reinstated/>

FIGURE 8 THE 70/30 RULE COMES INTO EFFECT FOR SUMMER 2022



Given that incumbent airlines may reasonably expect the historical premium to re-establish itself once demand returns to pre-pandemic levels, airlines may well be prepared to increase capacity, rather than relinquish their slots, even if the growth in demand is not yet there – especially since slots at Heathrow were being transferred between airlines for tens of millions of pounds only a few years ago. All things being equal, this increase in capacity will actually result in **falling** ticket prices¹⁸ and short-term losses, but will enable airlines to earn premium ticket prices in the future.

Given this dynamic, it is very difficult to argue that higher airport charges will be passed through to passengers, and there will certainly not be a direct link. An increase in airport charges would only be passed through to passengers (indirectly) in the form of higher prices if airlines reduced capacity. However, given the 70/30 rule, we are actually seeing the opposite happen.

WE SEE NO EVIDENCE OF HIGHER AIRPORT CHARGES NEGATIVELY IMPACTING ROUTE VIABILITY

It is plausible that, when faced with higher operating costs, an airline may decide to withdraw from a route entirely, rather than just reduce capacity. However, for the reasons set out above, the 70/30 rule may mean that airlines’ capacity decisions in 2022 will be based more on retaining slots rather than on changes to airport charges – which is supported by the data for April 2022. Also, analysis of schedules data at Heathrow suggests that this concern is not supported by the data. It is very telling to note that:

¹⁸ As noted earlier, in the airline sector an increase in capacity on a given route puts a downward pressure on ticket prices. However, over the course of 2022, demand will likely increase – as noted by the CAA’s passenger forecasts – meaning that the net impact on prices will depend on the balance between supply and demand.

- In Q1 2019, there were 192 connections operated at Heathrow, served with an average of 3.2 departures per connection per day; and
- In Q1 2022, there were 198 connections operated at Heathrow, served with an average of 1.93 departures per connection per day.

Therefore, based on the evidence, it would appear that the increase in airport charges has not had a negative impact on the route network offered at Heathrow. At a high level, the network is basically the same, but served less frequently.

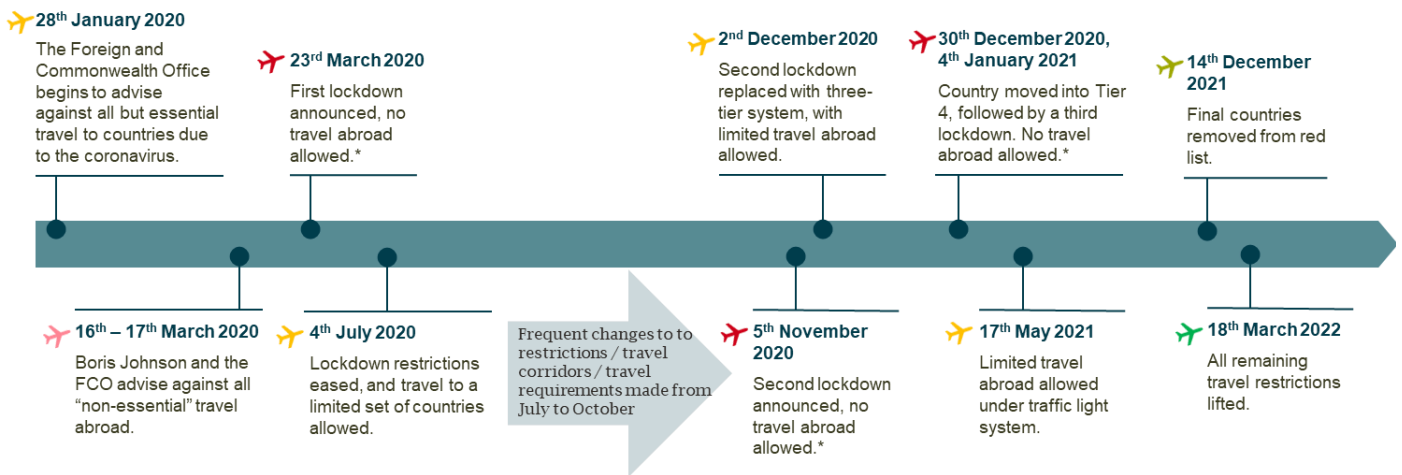
1 INTRODUCTION

1.1 BACKGROUND

Heathrow’s airport charges – i.e. the charges paid by airlines to use Heathrow’s infrastructure and airport services – are regulated by the CAA. The CAA is currently in the process of determining Heathrow’s maximum allowable yield per passenger for the H7 period, which covers 2022-2026.

The key issue at the heart of the H7 price control is Covid. The pandemic has had an unprecedented impact on the whole aviation sector. A timeline of travel restrictions is shown below.

FIGURE 9 TIMELINE OF UK TRAVEL RESTRICTIONS

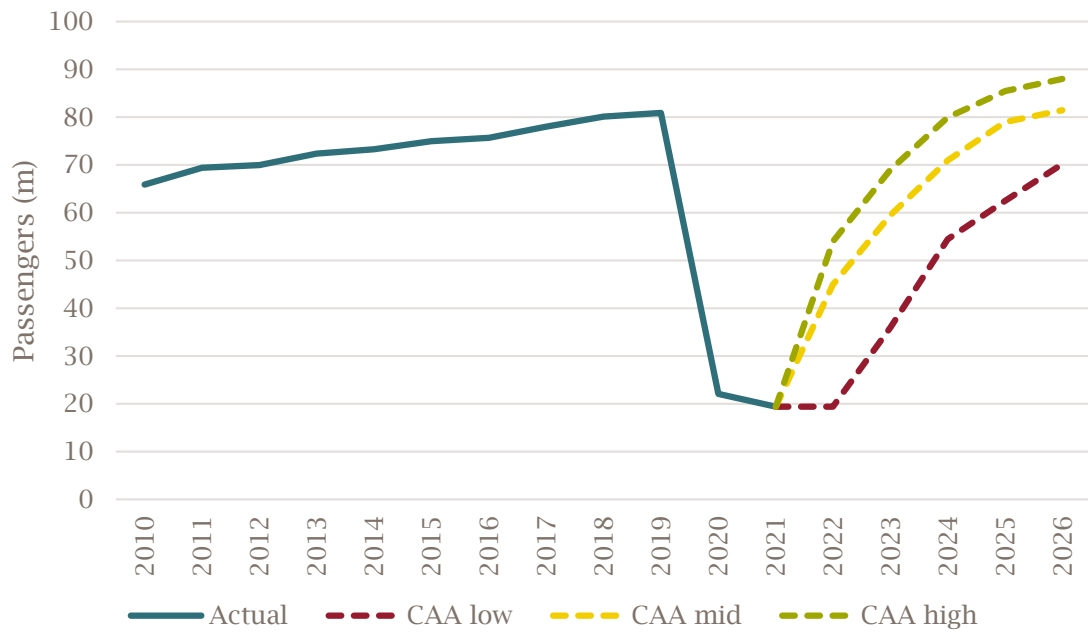


* Limited travel abroad was allowed for those with a “legally permitting reason”, such as for work.

Source: Frontier summary

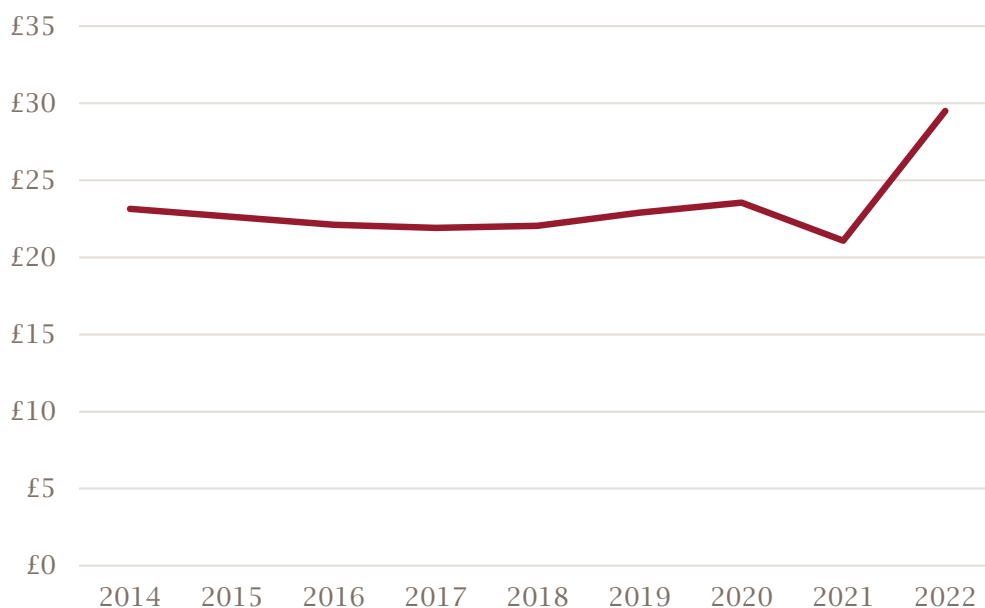
Prior to the pandemic, Heathrow handled around 80 million passengers per annum. This fell to around 20 million passengers (-73%) in 2020. Since then, the sector has seen a slow and uneasy recovery, and the future is extremely uncertain. While the CAA has produced passenger forecasts out to 2026, there is no precedent for these circumstances and so all forecasts need to be viewed with considerable caution. We note that, unsurprisingly, there is a very wide range in the CAA’s forecasts.

FIGURE 10 PASSENGER VOLUMES AT HEATHROW FELL BY MORE THAN 70% IN 2020 RELATIVE TO 2019



Source: Frontier analysis of Heathrow and CAA data

In this context, the task of determining a reasonable level for Heathrow’s airport charges is extremely challenging. For 2022, the CAA has made an interim decision that Heathrow is allowed to charge airlines up to £30 per passenger on average. This equates to an increase of around 40% relative to charges in 2021. As noted by the CAA, “the upward pressure on prices in this period is driven primarily by lower forecast passenger numbers rather than a material and sustained increase in operating and capital costs”. In other words, while Heathrow can be expected to downsize a proportion of its operating costs in response to lower volumes, a large proportion of its costs (including its allowed return and depreciation on existing assets) are essentially fixed, which, when recovered over a smaller number of passengers, results in higher average costs.

FIGURE 11 HEATHROW'S MAXIMUM ALLOWABLE YIELD PER PASSENGER

Source: Frontier analysis of Heathrow's annual charges consultations

Airlines at Heathrow have voiced serious concerns about this price increase:

- Heathrow's airport charges are unreasonable: Willie Walsh, Director General of IATA and former CEO of IAG and BA called Heathrow a "greedy monopoly hub" and said the increase in airport charges was "outrageous".¹⁹ He also called on the UK's Secretary of State to intervene.²⁰
- Airport charges will lead to higher ticket prices: airlines have argued that these higher airport charges will be passed through to passengers in the form of higher ticket prices. For instance, Virgin Atlantic has been reported as saying the increase in airport charges adds up to £200 to the cost of a family trip to Florida.²¹
- Route viability will be impacted: BA has raised the possibility of reducing its capacity at Heathrow, with IAG's CEO reported as commenting that "if the rise in landing charges goes ahead, I know IAG will not be alone in reconsidering our airlines' use of Heathrow".²²

We have been commissioned by Heathrow to review these concerns.

1.2 STRUCTURE OF THIS REPORT

The rest of this report is structured as follows:

¹⁹ <https://www.reuters.com/business/aerospace-defense/head-world-airline-group-blasts-heathrow-plan-higher-fees-2021-10-13/>

²⁰ <https://www.telegraph.co.uk/business/2021/12/16/heathrow-cleared-increase-charges-seven-times-rate-inflation/>

²¹ <https://www.dailymail.co.uk/news/article-10316473/Heathrow-passengers-pay-30-airport-charges-adding-200-cost-family-trip-Florida.html>

²² <https://www.independent.co.uk/travel/news-and-advice/british-airways-heathrow-airport-charges-b1962704.html>

- In **Section 2** we highlight that Heathrow's **airport charges are regulated** and designed to be cost-reflective. For 2022, they are actually below cost;
- In **Section 3** we discuss that **airport charges are one component of an airline's overall cost structure**;
- In **Section 4** we discuss **the link between ticket prices and airport charges at Heathrow**. We describe how the scarcity of slots at Heathrow still acts as a barrier to entry, and how the rules around slot allocation mean that we do not expect to see the increase in airport charges passed through to passengers in the form of higher ticket prices;
- In **Section 5** we analyse ticket prices and find that there is **continued evidence of a premium on Heathrow ticket prices in 2020 and 2021** and discuss implications of the 70/30 rule in 2022
- In **Section 6** we highlight that there is no evidence to suggest that **route viability** at Heathrow has been negatively impacted;
- In **Section 7** we summarise our **conclusions**; and
- In **Annex A** we provide more details on our **econometric analysis** which shows that there is still a **significant premium on ticket prices** at Heathrow. This updates our previous work for Heathrow in which we found that - prior to the pandemic - there was a premium on ticket prices at Heathrow worth around £2 billion per annum in additional revenue to airlines.

2 HEATHROW’S AIRPORT CHARGES ARE REGULATED AND DESIGNED TO BE COST-REFLECTIVE

2.1 INTRODUCTION

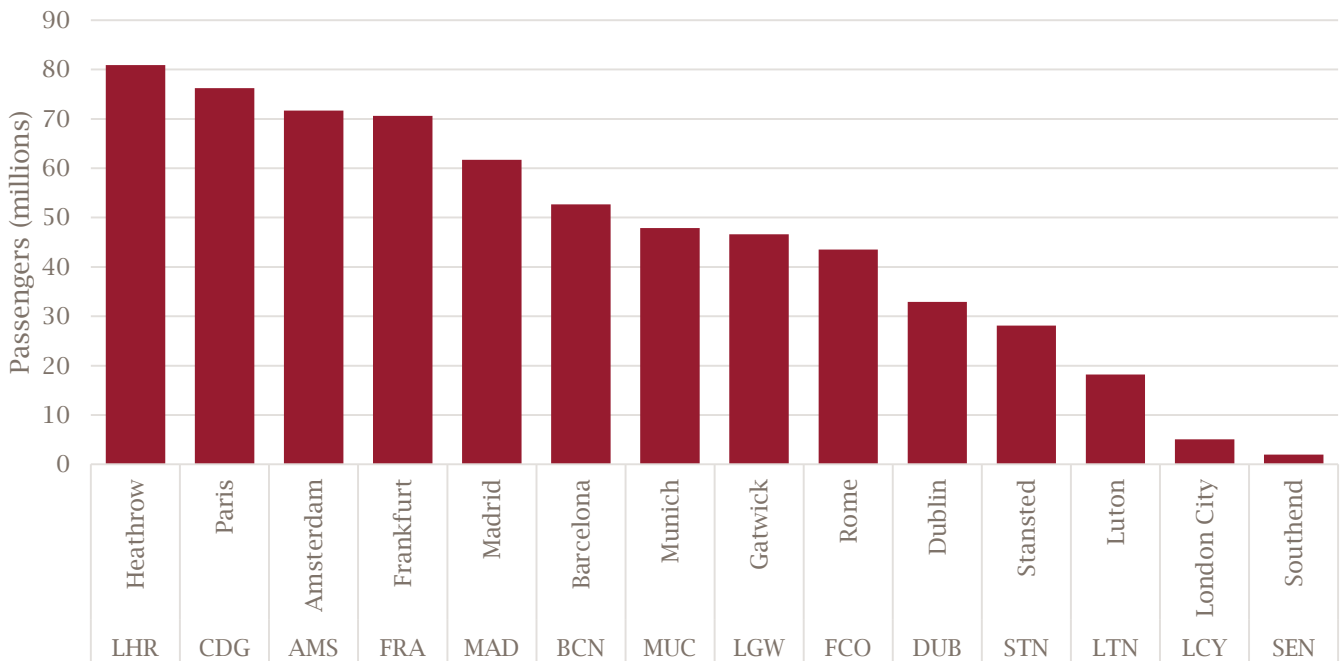
In this section we discuss the following points:

- Benchmarking does show that Heathrow’s charges are indeed high compared to those at comparator airports;
- However, it is important to note that Heathrow’s airport charges are regulated by the CAA, and are designed to be cost-reflective; and
- Due to this, benchmarking is not particularly relevant, and the results need to be interpreted with caution.

2.2 BENCHMARKING SHOWS THAT HEATHROW’S CHARGES ARE INDEED HIGH

We have carried out high level benchmarking analysis of airport charges at Heathrow compared to those at other airports in London and the largest airports in Europe – based on passenger volumes in 2019 (i.e. before the pandemic). The chart below reports the sample of airports considered in the analysis.

FIGURE 12 SAMPLE – TOP 10 BUSIEST AIRPORTS IN EUROPE & OTHER LONDON AIRPORTS (2019)



Source: Frontier analysis.

Notes: Heathrow and Gatwick appear in both the ‘Top 10 busiest airports in Europe’ sample and the London sample.

We have then identified the airport charges at these airports, based on publicly available information reported on airports’ websites.²³

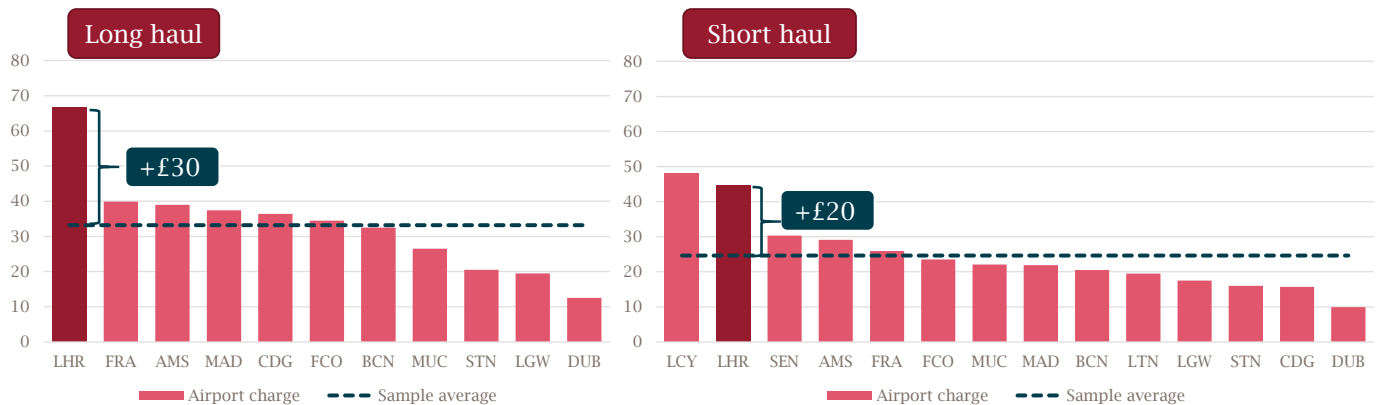
First, we note that the structure of charges varies from airport to airport. Airports typically levy a set of passenger-related charges (often with a lower charge for passengers flying to short haul destinations and a

²³ For instance, see airport charges at Frankfurt: <https://www.fraport.com/en/business-areas/operations/airport-charges.html>

higher charge for passengers flying to long haul destinations) and a set of aircraft- / movement-related charges (typically with lower charges for narrow-bodied aircraft, and higher charges for wide-bodied aircraft. Given that the structure varies from airport to airport, we have therefore needed to define a set of representative airlines turnarounds – including assumptions on aircraft model, load factor, aircraft parking time etc. – and then calculate, based on the publicly available tariff books, how much it would cost to operate that turnaround at each airport. We have produced results for short haul and long haul separately.

This high level benchmarking does confirm that airport charges at Heathrow are high compared to those at comparator airports. Also, the chart below is based on data on airport charges from 2021, and does not yet capture the c40% increase in airport charges at Heathrow in 2022, but it is clear that Heathrow does have high charges compared to other airports.²⁴

FIGURE 13 AVERAGE CHARGE PER DEPARTING PASSENGER (2021, GBP)



Source: Frontier analysis

Note: The figures above are based on how much it would cost – on a per departing passenger basis – to operate representative airline turnarounds at each of the airports in the sample based on their publicly available airport charges. This was based on assuming a A320 for short haul operations and a B777 for long haul operations, which are BAs most common aircraft types for short haul and long haul respectively, and various other assumptions on aircraft parking and load factors etc.. We note that the results do change if we were to change those operating assumptions. However, under all reasonable assumptions, the general picture above remains – i.e. Heathrow being most expensive for long haul and generally expensive for short haul. Heathrow's maximum yield per passenger figures reported earlier relate to how much Heathrow can charge per passenger. However, in practice, airports generally charge airlines as they depart the airport only and not as they land. Therefore, the charge per departing passenger is generally twice as high as the average revenue per passenger.

2.3 HEATHROW'S CHARGES ARE REGULATED AND ARE DESIGNED TO BE COST-REFLECTIVE

When discussing airport charges at Heathrow it is important to recognise that its charges are regulated by the CAA and are designed to be cost-reflective. Ultimately, the amount that Heathrow is allowed to charge to airlines in 2022 was determined by the CAA based on a lengthy and well-considered process. The CAA has published extensive documentation underlying its decision, which included commissioning a number of expert reports.²⁵ This means after careful analysis by the CAA it has been accepted that Heathrow's costs are reasonably efficient, notwithstanding the fact that they are higher than at many other airports. In other

²⁴ Explaining why Heathrow's airport charges are higher than those at the other airports in our sample was not in the scope of this project. However, we would note that (i) Heathrow is located to the west of London where land values and labour rates are particularly high, which can be expected to put an upwards pressure on opex and capex / depreciation; (ii) Heathrow is recognised as having high levels of service quality – e.g. since 2011, Heathrow has appeared in Skytrax's Top 20 'best airports in the world' for service quality, outperforming the other London airports in all years; and (iii) Heathrow is a large, complex, hub airport – and the largest airport in Europe – which means it is not particularly comparable to some of the other airports in the sample.

²⁵ <https://consultations.caa.co.uk/economic-regulation/h7-initial-proposals-october-2021/>

words, Heathrow's charges can be defended as reasonable given the cost environment it operates in and the complexity of its operations.

We discuss these points in more detail below.

HEATHROW IS SUBJECT TO ECONOMIC REGULATION BY THE CAA

The CAA has determined that Heathrow has 'significant market power' (SMP).²⁶ As highlighted by the CAA, market power "is the ability, profitably, to sustain prices above the competitive level or restrict output or quality below competitive levels". In other words, a firm with SMP has the ability to earn large profits by setting prices above cost, whereas in a more competitive market we would expect to see lower prices and firms earning more modest levels of profit. Setting prices above cost is clearly to the detriment of consumers:

- **Loss of consumer surplus:** Consumers that choose to buy the good or service end up paying more than they would under a more competitive scenario, and they have less money to spend on other things.
- **Deadweight loss:** Some consumers cannot afford to buy the good or service, even though they would be able to under a more competitive scenario. They miss out on the enjoyment of the good or service.

In light of this finding of SMP, the CAA has determined that the appropriate course of action is to regulate airport charges at Heathrow through a series of periodic price controls. The CAA is currently determining airport charges for 'H7' (i.e. the seventh periodic review of charges at Heathrow) which covers the period 2022-2026. In carrying out this role, the CAA's primary duty is to "further the interests of users of air transport services regarding the range, availability, continuity, cost and quality of [airport services]" whilst ensuring that Heathrow does not find it unduly difficult to finance itself:²⁷ "it is also vital for consumers that airport charges raise sufficient revenue to allow HAL [Heathrow] to provide an appropriate level of service and finance new investment, including the capital spending necessary to keep the airport safe and secure."²⁸

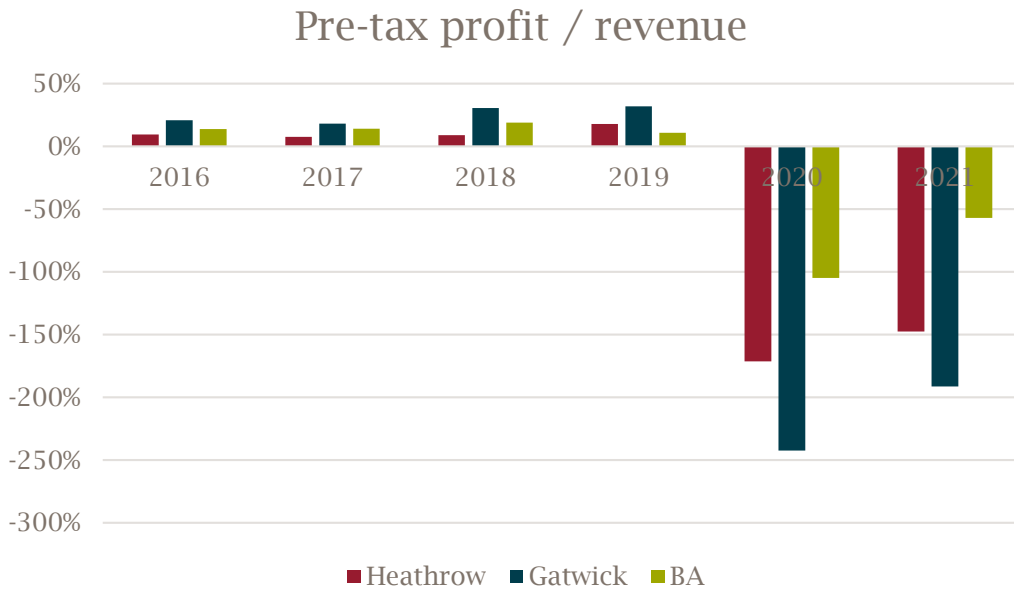
The overall purpose of the regulation is therefore to achieve the positive outcomes that we might expect to see in more competitive markets, including lower prices and improved service quality. Ultimately, economic regulation limits Heathrow's ability to exploit existing market power and generate profits in excess of its cost of capital. The chart below highlights that, before the pandemic, Heathrow reported levels of profitability lower than those at Gatwick and generally lower than those at BA too. All three businesses made significant losses in 2020 and 2021 due to Covid-19. In light of the regulation surrounding Heathrow and its historical financial performance, IATA's comments about Heathrow would appear to be emotive, lacking in context and contribute little to the debate about the appropriate level of airport charges.

²⁶ <https://publicapps.caa.co.uk/docs/33/CAP%201133.pdf>

²⁷ <https://www.legislation.gov.uk/ukpga/2012/19/part/1/chapter/1/crossheading/general-duties?view=plain>

²⁸ [https://publicapps.caa.co.uk/docs/33/CAP2265A%20H7%20Summary%20\(p\).pdf](https://publicapps.caa.co.uk/docs/33/CAP2265A%20H7%20Summary%20(p).pdf)

FIGURE 14 HEATHROW'S PROFITABILITY

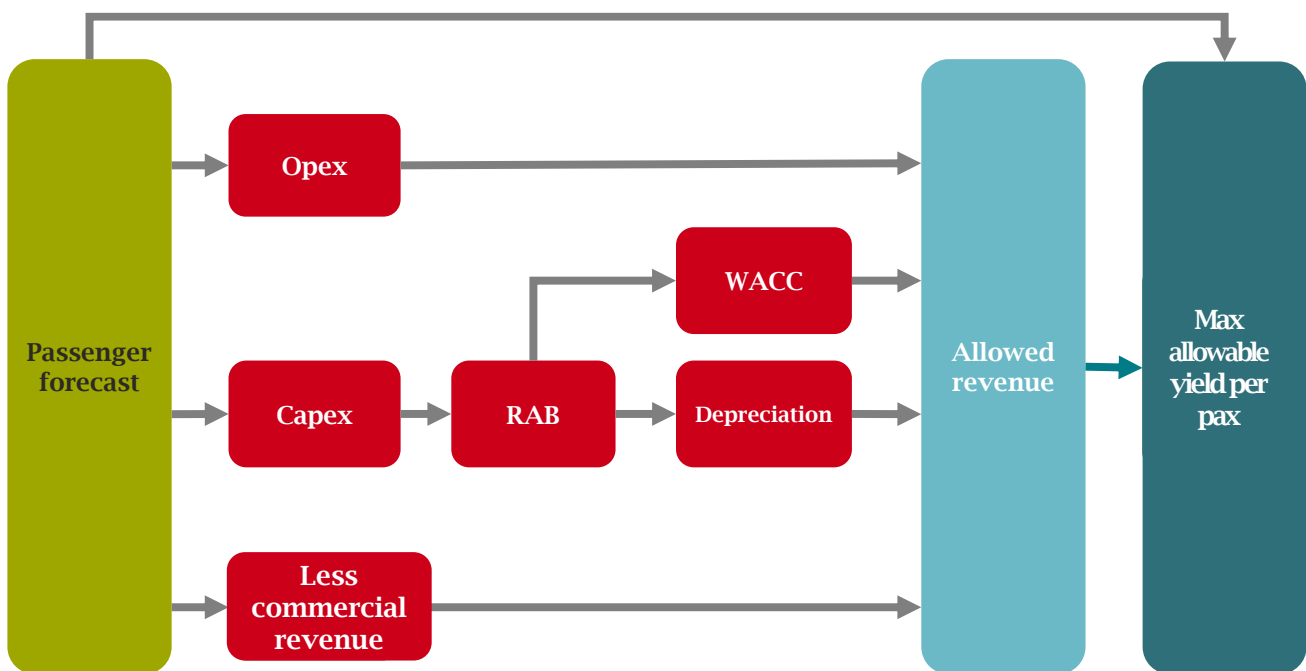


Source: Frontier analysis based on annual reports

OVERVIEW OF REGULATORY MODEL

At a high level, the CAA adopts a “building-blocks” approach to regulating charges at Heathrow, not dissimilar to that applied to other regulated infrastructure (including other regulated airports internationally). An overview of the CAA’s approach to regulating Heathrow’s airport charges is set out below.

FIGURE 15 OVERVIEW OF HEATHROW'S REGULATORY MODEL



Source: Frontier illustration

Note: Opex, capex, and commercial revenue are forecasts rather than outturn

At a high level, the CAA determines an allowed revenue per passenger (maximum allowable yield per passenger) for each year of the price control which is set equal to its forecast of the average cost per passenger in that year.

The process is split out into three broad steps:

- **Demand forecast:** First, the CAA produces a passenger forecast in order to understand what level of demand the airport is expected to serve over the period 2022-26.²⁹
- **Cost forecast:** Second, the CAA then determines what an efficient level of cost is to serve this demand each year. The total cost is split out into four components or ‘building blocks’:
 - **Operating costs (‘opex’):** This covers the ongoing cost of running the airport, including labour costs and utilities. As part of the H7 process, Heathrow published its Business Plan in December 2020, in which it set out its opex forecast for the period.³⁰ The CAA has scrutinised Heathrow’s forecast to determine its view on an efficient level of opex for the period. This involved commissioning consultants to review Heathrow’s approach, to analyse historical and forecast cost drivers, to carry out benchmarking, to analyse price trends for input costs such as energy and labour, and to assess the scope for efficiency gains in the future.
 - **Depreciation:** In addition to operating costs, Heathrow routinely invests in capital assets (‘capex’) with long lifetimes (e.g. new terminal space). Rather than recovering these costs in a single period – which could result in sharp increases in charges and volatility – these costs enter Heathrow’s Regulatory Asset Base (RAB)³¹ and are recovered over time through depreciation. Heathrow’s capex delivery is scrutinised such that only capex deemed to have been incurred efficiently enters the RAB. This ensures that airport users do not pay for any capex deemed to have been inefficiently incurred. Heathrow’s depreciation for H7 therefore partly relates to capital investments made in previous periods, which continue to be depreciated, and partly relates to new capital investments made during H7. For these new investments, the CAA has scrutinised Heathrow’s capex plan and has determined its view on an efficient level of capex for H7, which then impacts on depreciation each year accordingly. For H7, the CAA is forecasting a depreciation charge each year which equates to around 5% of the RAB, suggesting that the RAB is fully depreciated over a c20 year period on average.

²⁹ Clearly, given the uncertainty brought about by Covid-19, it is particularly challenging to produce a passenger forecast for 2022-26. To help mitigate this risk, the CAA is proposing to introduce a Traffic Risk Sharing (TRS) mechanism. At a high level, if actual passengers turn out to be above the passenger forecast, Heathrow will effectively lower its airport charges in the next regulatory period, and vice versa.

³⁰ Heathrow Airport H7 Revised Business Plan (detailed) December 2020
<https://www.heathrow.com/content/dam/heathrow/web/common/documents/company/about/economic-regulation/RBP-detailed-plan.pdf>

³¹ The RAB is a financial record which keeps track of the capital value invested in the regulated business over time less depreciation. The RAB is calculated each year by taking the opening RAB, adding capital expenditure, and deducting forecast regulatory depreciation and any proceeds from asset disposals. It is then uplifted by inflation to give the closing RAB. The CAA also has some discretion. The RAB does not necessarily need to be linked back to a register of assets. For instance, in principle, the CAA could decide to capitalise a proportion of opex and enter it into the RAB to be recovered over a longer period of time rather than recovering it in-period. Therefore, the RAB can be used as a flexible tool to help strike a balance between cost-recovery and affordability.

- **Allowed return:** The CAA also determines an allowed return on the RAB. This captures that if Heathrow were to simply recover its operating costs and depreciation only, it would earn no return on capital. Given that airports require a significant amount of capital investment and Heathrow needs to be able to raise cost-effective finance from investors, the CAA makes an allowance for a reasonable level of economic profit. This is based on estimating the risk-free return (e.g. through government bonds), the total market return (e.g. returns from equity markets), and then considering the relative level of risk at Heathrow.³²
- **Non-aeronautical / commercial revenue:** Heathrow is regulated under a ‘single till’ approach.³³ This means that any revenue that it generates from non-aeronautical activities – which includes revenue from retailers and car parking services – is effectively used to cross-subsidise airport charges. Under a single till approach, aeronautical revenue is actually lower than the cost of providing the aeronautical services, with non-aeronautical revenue making up the shortfall. (In effect, non-aeronautical revenue looks similar to a negative opex item.) Similar to opex, the CAA has scrutinised Heathrow’s forecast and come to its own view on the forecast for the period.
- **Average cost per passenger:** Having determined these building blocks, the CAA then divides the forecast total cost in each year (i.e. operating costs + depreciation + allowed return – non-aeronautical revenue) by the forecast passenger volumes in each year to derive an average cost per passenger figure. This is the final output of the regulatory process and becomes the maximum allowable yield per passenger.³⁴

In parallel, in order to ensure that Heathrow does not cut costs by simply reducing service quality, the CAA also sets targets for various measures of service quality.³⁵ For instance, this includes targets for length of security queues, cleanliness, availability of seating, wayfinding, etc.. Heathrow incurs financial penalties if it does not meet these targets.

³² Note that, because Heathrow’s RAB is indexed by inflation, the return allowed on its assets is calculated in real terms, or constant prices.

³³ Airports generate revenue from two main sources: (i) ‘aeronautical’ services: this is the primary function of the airport, and includes providing landing and take-off services for airlines and terminal services for passengers; and (ii) ‘non-aeronautical’ services: this is effectively a by-product of the aeronautical activity, and includes providing car parking services, space for retailers, hotels and conference centres, etc.. Many costs at the airport are fixed and common across these two services – e.g., head office and terminal space will be used by both aeronautical and non-aeronautical services. A ‘dual till’ approach to regulating airport charges argues that total costs should first be allocated between these two services, and that airport charges should then be set at a level to recover the total cost of the aeronautical services only (i.e. the opex, depreciation and reasonable return associated with the aeronautical services). We note that there is no single right answer on how to allocate common costs between aeronautical and non-aeronautical services. A ‘single till’ approach does not require this cost allocation exercise, and instead argues that airport charges should be set at a level to recover total costs overall, covering both aeronautical and non-aeronautical services. This means that any profit from the non-aeronautical business is effectively used to subsidise airport charges. A ‘hybrid till’ approach lies somewhere in between single till and dual till, whereby a proportion of the profits from the non-aeronautical business is used to subsidise airport charges. The relative merits of single vs. dual or hybrid tills is outside the scope of this report.

³⁴ In practice, Heathrow has some flexibility about how it actually structures its charges, as long as it does not exceed the maximum amount per passenger on average. For instance, as set out in its consultation on the structure of charges for 2022, it recovers just over 50% of its total aeronautical revenue from passenger charges (with lower charges for passengers flying to short haul destination, and higher charges more for passengers flying to long haul destination), with most of the remainder recovered from movement charges (with higher charges for wide-bodied aircraft and lower charges for narrow-bodied aircraft). Heathrow’s consultation on charges for 2022 can be found here:

<https://www.heathrow.com/content/dam/heathrow/web/common/documents/company/doing-business-with-heathrow/flights-condition-of-use/consultation-documents/Heathrow-Airport-Charges-Consultation-Document-2022.pdf>

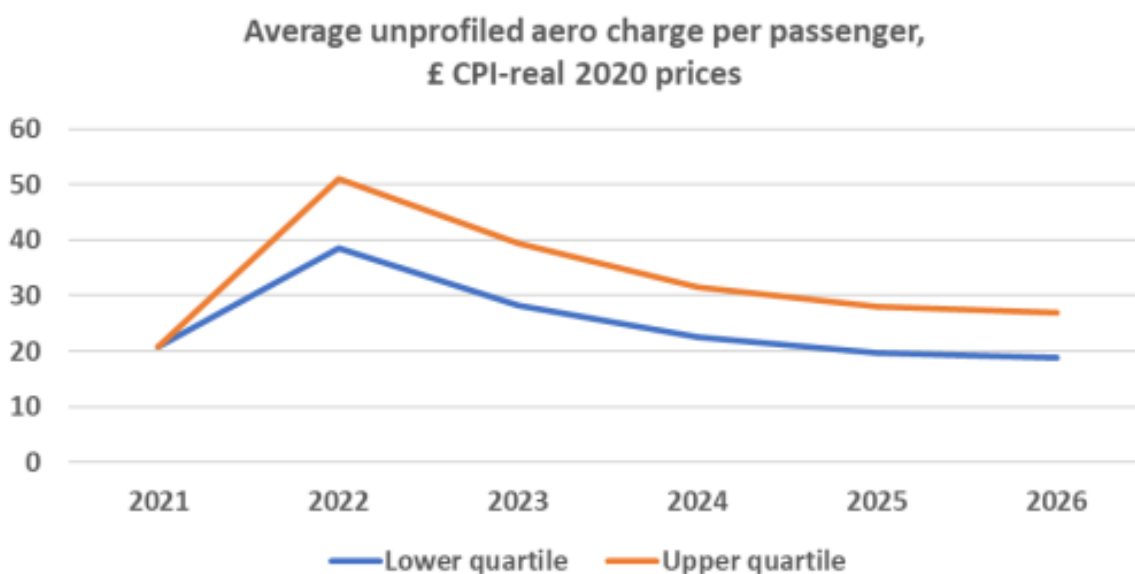
³⁵ <https://publicapps.caa.co.uk/docs/33/CAP2265D%20H7%20Incentives%20and%20other%20issues.pdf>

Therefore, the CAA’s approach to setting charges at Heathrow involves a lengthy and well-considered process. Charges are designed to be cost-reflective, where the CAA’s forward-looking view on cost reflects the unavoidable costs Heathrow faces, given its location and complexity, and also includes an on-going year-on-year efficiency challenge.

THE CAA’S DECISION FOR 2022

By following the steps outlined above, the CAA has published its Initial Proposals for Heathrow’s maximum allowable yield per passenger for H7. As the CAA is still working with various ranges for the building blocks described above, it has produced an ‘upper quartile’ (high) and a ‘lower quartile’ (low) scenario for Heathrow’s maximum allowable yield. This is shown below. It will firm up these forecasts to produce a central view as part of its Final Proposals – which are expected in Summer 2022.

FIGURE 16 THE CAA’S SUMMARY OF INITIAL PROPOSALS FOR AIRPORT CHARGES - UNPROFILED



Source: CAA Initial Proposals for H7
[https://publicapps.caa.co.uk/docs/33/H7%20Initial%20Proposals%20Section%202%20Financial%20issues%20\(CAP2265C\).pdf](https://publicapps.caa.co.uk/docs/33/H7%20Initial%20Proposals%20Section%202%20Financial%20issues%20(CAP2265C).pdf)

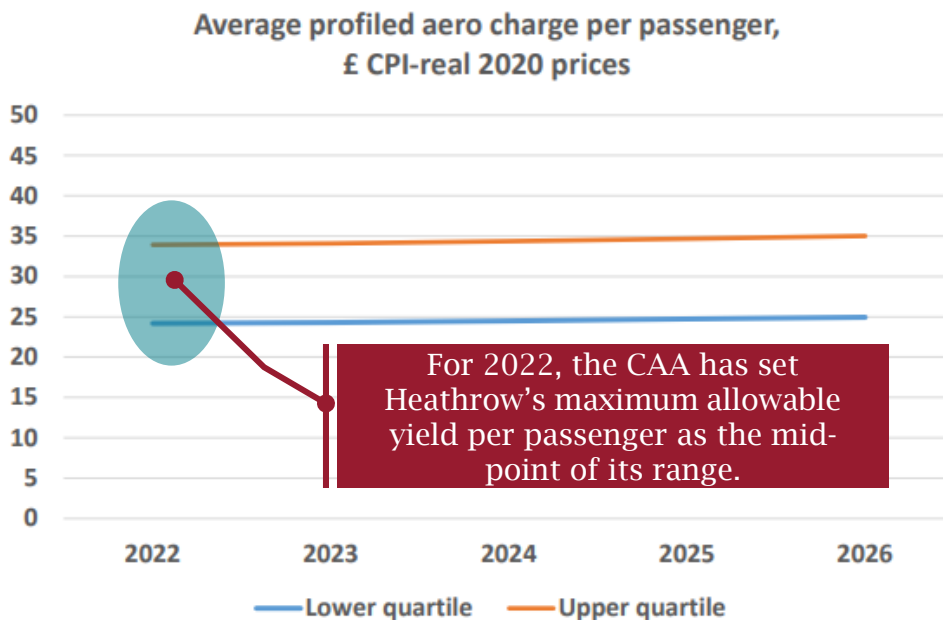
Under the high scenario, the CAA’s approach results in charges forecast to increase from around £20 per passenger in 2021 to over £50 per passenger in 2022 – i.e. the charge more than doubles. Even under the low scenario, the charge is forecast to increase to just under £40 per passenger in 2022. Under both scenarios, the charge is then forecast to decrease over the period. As highlighted by the CAA, the main reason driving this profile is ultimately the passenger forecast: the CAA’s passenger forecast returns back towards pre-pandemic levels over the course of H7 which results in average costs decreasing, and therefore charges decreasing. In other words, while Heathrow can downsize a proportion of its operating costs in response to lower passenger volumes, its allowed return and depreciation on existing assets are essentially fixed costs, as well as some elements of opex.

However, the CAA is of the view that this volatile profile of charges, whilst cost-reflective, is not in the interest of airlines and passengers. It notes that “it is difficult to reconcile this level of increase as being consistent with the interests of consumers as airlines would likely fund this through higher ticket prices... large increases in airport charges in 2022 could constrain the recovery in services at Heathrow... during this critical year in the recovery of the sector.”³⁶ (However, this makes implicit assumptions about cost

³⁶ [https://publicapps.caa.co.uk/docs/33/H7%20Initial%20Proposals%20Section%202%20Financial%20issues%20\(CAP2265C\).pdf](https://publicapps.caa.co.uk/docs/33/H7%20Initial%20Proposals%20Section%202%20Financial%20issues%20(CAP2265C).pdf)

passthrough which we discuss later.) In response to these concerns, it is proposing to smooth prices over the period 2022-26, keeping prices artificially below cost in the earlier years before increasing prices above cost in the later years when passenger volumes hopefully return back to pre-pandemic levels. This smoothing of charges over the period is shown below:

FIGURE 17 THE CAA’S SUMMARY OF INITIAL PROPOSALS FOR AIRPORT CHARGES – PROFILED



Source: CAA Initial Proposals for H7
[https://publicapps.caa.co.uk/docs/33/H7%20Initial%20Proposals%20Section%20%20Financial%20issues%20\(CAP2265C\).pdf](https://publicapps.caa.co.uk/docs/33/H7%20Initial%20Proposals%20Section%20%20Financial%20issues%20(CAP2265C).pdf)

This means that under the high scenario the charge per passenger is set at around £35 per passenger over the course of H7, and around £25 per passenger under the low scenario. For 2022, the CAA has made an interim decision to set the allowed charge at the mid-point of this range – which explains the origin of the c£30 per passenger figure for 2022. (When the CAA publishes its Final Proposals for H7 in the summer, it will come to a final view on this figure, where any difference will be retrospectively adjusted through the RAB.)

Therefore, strictly speaking, the £30 figure can actually be described as being below efficiently-incurred cost for 2022:

- **Smoothing:** By smoothing prices over the period in order to promote stability, the CAA has intentionally set charges below cost in the early years of H7 (including 2022), and then above cost towards the back end of H7. This means that if Heathrow’s performance over H7 does materialise in line with the CAA’s various forecasts (for passengers, opex, commercial revenue, etc.) Heathrow can expect to make losses in 2022, which will be offset by profits in later years.
- **Disagreements on building blocks:** The maximum allowable yield per passenger is based on the CAA’s forecasts. However, as set out in its response to the CAA’s Initial Proposals, Heathrow has expressed serious concerns that those forecasts are unreasonable.³⁷ The table below summarises Heathrow’s views on the building blocks which ultimately results in an average charge of around £42 per passenger over H7. Therefore, it remains to be seen whether Heathrow can actually operate profitably within the cap set by the CAA. After reflecting on Heathrow’s response to its Initial

³⁷ <https://www.caa.co.uk/media/hjsnzxfm/heathrow-s-cap2265-response-redacted-1.pdf>

Proposals – and representations made by other stakeholders, including airlines – the CAA will publish its Final Proposals in Summer 2022. This may result in the CAA retrospectively changing the maximum allowable yield per passenger for 2022.

FIGURE 18 HEATHROW'S VIEW ON AIRPORT CHARGES FOR H7

Assumptions	RBP Update 2 Case
Passenger Forecast	317.1m
Opex (£m, 2018p)	£5,593*
Commercial revenues (£m, 2018p)	£[>]
Asymmetric risk adjustment (£m, 2018p)	£108
Cargo revenues (£m, 2018p)	£[>]
Capital Plan	£4.1bn
WACC	8.5%
RAB Adjustment	£2.53bn
Building block charge	£41.946

*Excludes Pension cash contribution

Source: Heathrow's response to the CAA's Initial Proposals for H7 <https://www.caa.co.uk/media/hjsnzxfm/heathrow-s-cap2265-response-redacted-1.pdf>

- **Efficiency challenge:** The CAA's forecasts also include a number of efficiency challenges. For instance, for opex, the CAA's consultants have assumed that Heathrow can achieve a 'frontier shift' of 1% per annum – i.e. that all things being equal, Heathrow's opex should fall by 1% per annum over the course of H7.³⁸ This approach is cumulative, meaning that (holding all else constant – including inflation) by 2025, Heathrow should be spending £0.95 for every £1 spent back in 2021. It remains to be seen whether Heathrow can achieve these efficiencies.

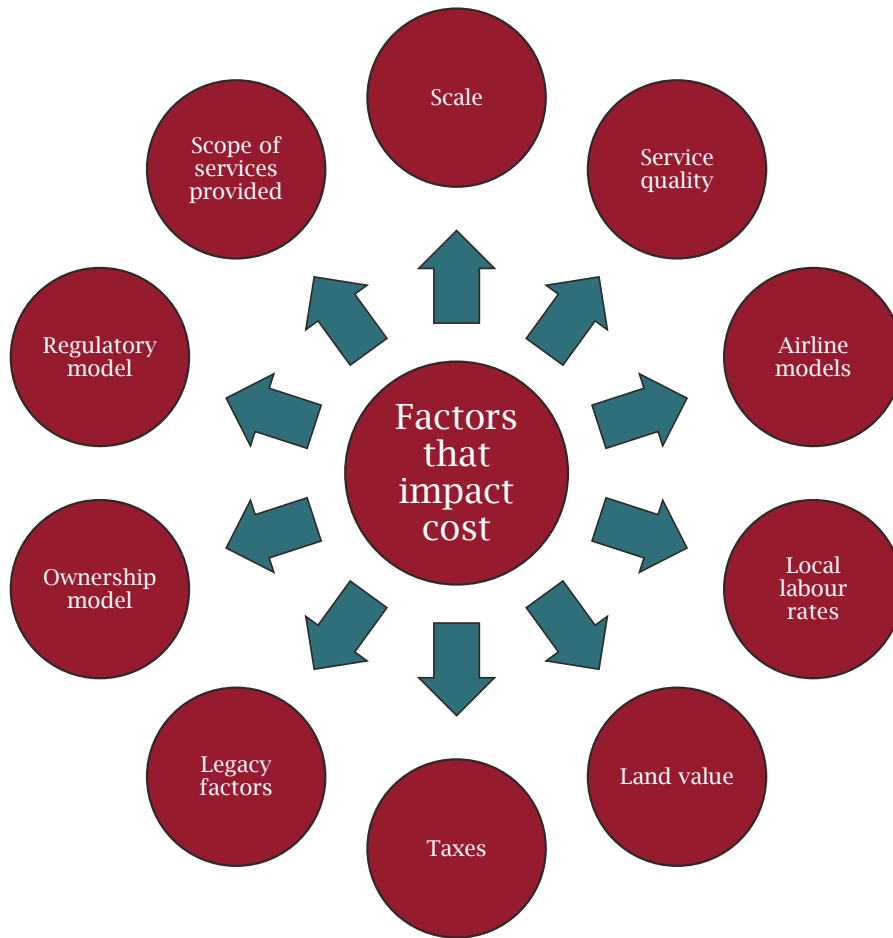
2.4 THERE ARE LIMITATIONS WITH BENCHMARKING

We have noted above that Heathrow's aeronautical charges are undoubtedly high, compared to most of its peers. However, as Heathrow's charges are regulated and limited to be cost-reflective given the particular circumstances at Heathrow, benchmarking needs to be interpreted with caution. All airports are different and there is no reason why charges should be the same across different airports when they operate in very different conditions, just as ticket prices vary between different airlines, or house prices vary from city to city or within cities. The chart below sets out factors that can explain legitimate differences in cost between airports.

38

[https://publicapps.caa.co.uk/docs/33/CAP2266A%20Review%20of%20H7%20Opex%20and%20Commercial%20Revenues%20In%20Assessment%20and%20Forecasts%20\(CEPA%20Taylor%20Airey%20October%202021\).pdf](https://publicapps.caa.co.uk/docs/33/CAP2266A%20Review%20of%20H7%20Opex%20and%20Commercial%20Revenues%20In%20Assessment%20and%20Forecasts%20(CEPA%20Taylor%20Airey%20October%202021).pdf)

FIGURE 19 FACTORS THAT IMPACT ON AIRPORT COST



Source: Frontier illustration

Given these factors, differences in charges between airports do not necessarily tell us much about the efficiency of those airports. Given that Heathrow’s charges are designed to be reflective of efficiently incurred costs (and the overall regulatory framework has limited Heathrow’s ability to earn excessive profits historically), this represents the ‘fair’ price for using the airport, and to some extent comparisons with other airports are not particularly relevant. In its Initial Proposals for H7 the CAA commented that “it is also vital for consumers that airport charges raise sufficient revenue to allow HAL [Heathrow] to provide an appropriate level of service and finance new investment, including the capital spending necessary to keep the airport safe and secure.”³⁹

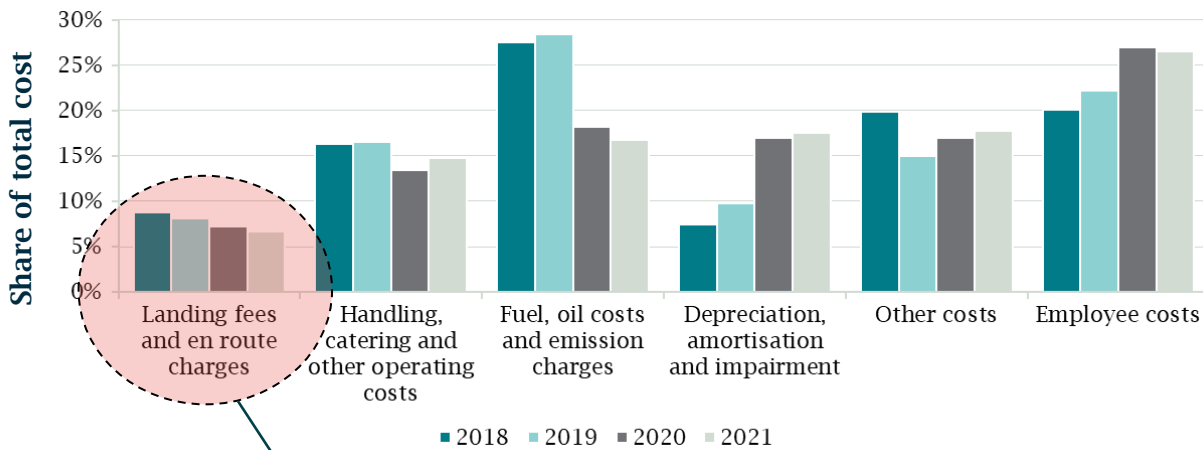
³⁹ [https://publicapps.caa.co.uk/docs/33/CAP2265A%20H7%20Summary%20\(p\).pdf](https://publicapps.caa.co.uk/docs/33/CAP2265A%20H7%20Summary%20(p).pdf)

3 AIRPORT CHARGES ARE ONE COMPONENT OF AN AIRLINE'S OVERALL COST STRUCTURE

Airport charges need to be placed in context as one component of an airline's overall cost structure, alongside other larger cost items which have also seen large increases in inflation since the start of the pandemic.

While recognising all costs are important in competitive markets, airport charges are a relatively small proportion of airline operating costs. By way of example, the chart below reports a breakdown of BA's operating cost over the past few years.⁴⁰ BA is the largest airline at Heathrow, with around a 50% market share in terms of the number of flights.

FIGURE 20 BRITISH AIRWAYS ANNUAL OPERATING COSTS



This includes ATC costs as well as airport charges at other airports. So Heathrow's airport charges represent around less than half of this total – i.e. c.2.5%-5% of BA's total costs. Therefore, a c40% increase in Heathrow's airport charges would represent a 1%-2% increase in total costs

Source: Frontier summary of BA annual reports

For BA, 'landing fees and en route charges' have historically represented around 5%-10% of total operating costs. However, we note that this cost item also includes costs for air traffic control (ATC) services, which are not provided by Heathrow, and it also includes the airport charges at all the other airports where BA operates (e.g. when BA flies between Heathrow and New York it pays airport charges at both ends). Therefore, Heathrow's airport charges likely represent less than half of this amount, at around 2.5%-5% of total operating costs. This means that the c40% increase in airport charges in 2022 amounts to around a 1%-2% increase in total operating costs relative to 2019 levels. However, it is worth putting the increase in airport charges at Heathrow in context of the other large cost increases experienced by airlines:

- Fuel: As shown above, prior to the pandemic, fuel costs represented around 25%-30% of BA's total operating costs. (However, this also includes other fuel-related costs such as compliance with ETS.) In the last two years, there has been a significant increase in fuel costs. For instance, at the end of 2019, a metric tonne of jet fuel was trading for about \$655 in Europe. After a sharp decline in fuel prices at the start of the pandemic, prices have since been on an upwards trend. By April 2022, a metric tonne of jet fuel is now trading for \$1,218 - nearly twice the price level observed prior to the pandemic.⁴¹

⁴⁰ <https://www.iairgroup.com/~media/Files/I/IAG/documents/british-airways-interim-reports/ba-2021-q2-imr-final.pdf>

⁴¹ Source: Bloomberg, European Jet FOB Rotterdam Barge Spot.

- Labour: Prior to the pandemic, labour represented around 20%-25% of BA's total operating costs. Like fuel, there has also been significant increase in labour costs in the UK and in the EEA. For example, the median wage in the UK increased by 12.6% between December 2019 and March 2022.⁴² The aviation sector has not been immune to this increase. For instance, media reports suggest that "British Airways is offering new cabin crew a £1,000 "golden hello" as the airline battles to recruit workers." (We would note that Heathrow is not protected from this increase in labour costs, which alongside the low passenger forecast also partly explains the upwards pressure on airport charges.)

The table below highlights that the 40% increase in airport charges at Heathrow in the past 2 years is dwarfed by the increases observed for fuel and labour over the same period.

TABLE 2

COST ITEM	% OF TOTAL OPERATING COSTS IN 2019 AS PER BA'S ANNUAL REPORT	% INCREASE IN COST 2019-2022	% INCREASE IN 2019 COST BASE
Airport charges at Heathrow	2.5%-5%	40%	1%-2%
Fuel	25%-30%	86%	21.5%-25.8%
Labour	20%-25%	12.6%	2.52%-3.15%
Total increase			25%-31%

Source: Frontier analysis

Of course, this is not to suggest that the increase in airport charges is not significant or material, and certainly when combined with the other cost increases it adds to the significant upward pressure on airline costs. However, when viewed alongside these other cost increases it casts doubt over whether the movement in airport charges at Heathrow can really be singled out as driving negative outcomes in the sector, especially when these charges are effectively identical across all airlines (so not a source of inter-airline rivalry at Heathrow), are designed to be cost-reflective, and are overseen by an independent regulator. The CAA has commented that "it is important to note that airport charges typically represent a relatively modest proportion of the air fares at Heathrow and so they would create a very significantly smaller percentage increase in the overall cost of travel." (However, this final point makes some implicit assumptions about cost passthrough which we discuss below.)

We would also highlight that airport charges are predictable in that they are consulted on many months in advance of coming into effect, and capped on a five year time horizon, giving airlines a clear line of sight over the direction of travel, and an opportunity to plan their capacity decisions accordingly. By contrast, other costs, including fuel in particular, are much more volatile and unpredictable and can leave airlines exposed to large differences between expected costs and actual costs. This is also important in the context of cost passthrough. Also, airlines do not make any commitment to future airport costs, which grants them a degree of flexibility in adjusting to changes in airport costs, by choosing to change capacity downwards if it is on their commercial interest.

Finally, we would note that the increase in airport charges at Heathrow has coincided with the requirement for Covid-19 tests largely being removed for most international travel. Under the rules before they were rescinded in January 2022, all passengers arriving in the UK had to take a pre-departure test and a PCR test

⁴² Source: Pay As You Earn (PAYE), HMRC

following arrival. For a family of four arriving in the UK, this imposed an additional cost of around £350.⁴³ Airlines UK was quoted at the time as saying: “This is a hugely welcome move at a critical time in the booking season for passengers, and will provide a massive boost to those wanting to travel abroad or come to the UK this year.”⁴⁴ And as noted in the next section, we believe it is unlikely that the higher airport charges at Heathrow will actually be passed on to passengers in the form of higher ticket prices.

⁴³ Assuming a fit-to-fly test cost of £20 and a PCR test cost of £70 per head.

⁴⁴ <https://www.theguardian.com/business/2022/jan/05/uk-travel-industry-international-covid-tests>

4 DUE TO BARRIERS TO ENTRY, THE LINK BETWEEN TICKET PRICES AND AIRPORT CHARGES IS WEAKENED OR EVEN BROKEN

4.1 INTRODUCTION

In this section we discuss airline cost passthrough at Heathrow, making the following points:

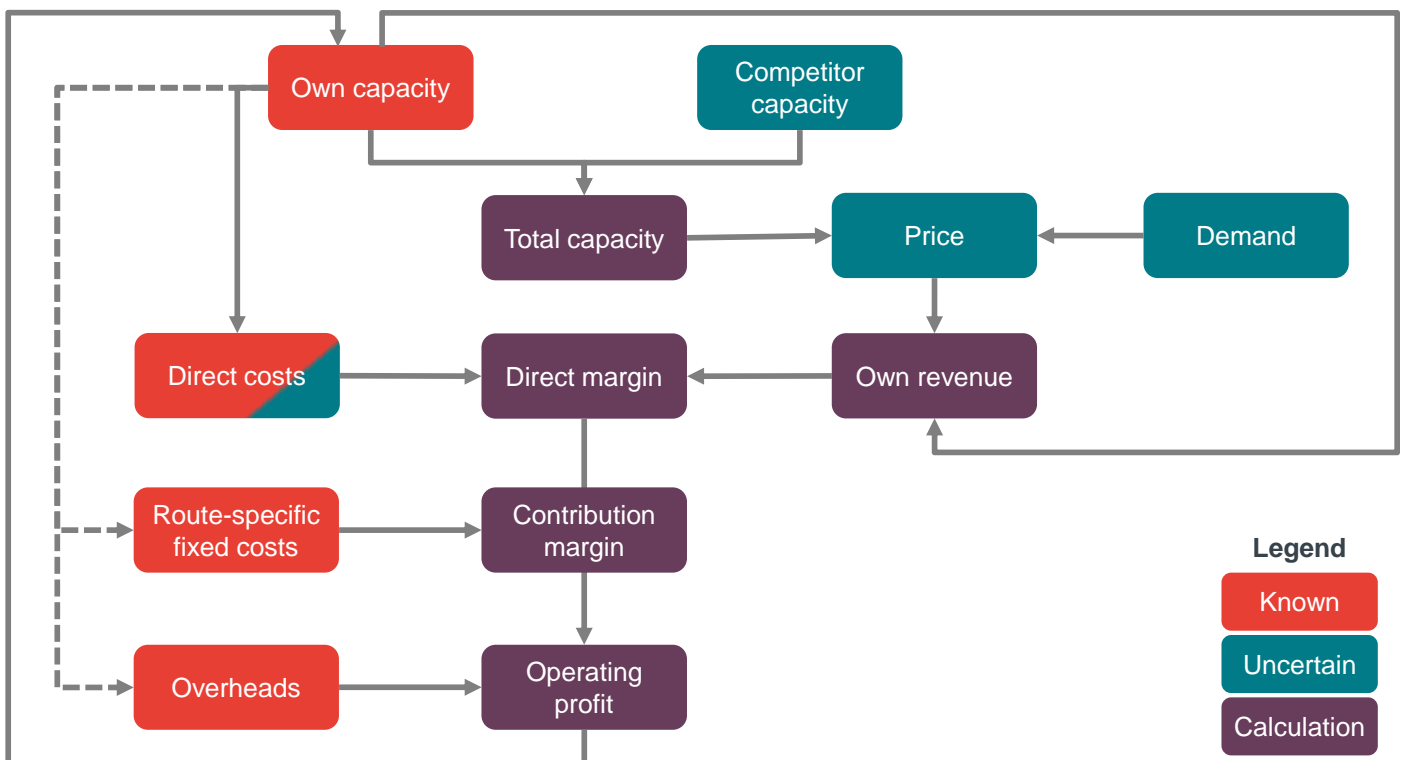
- First, we describe how in **a competitive market with no barriers to entry** we would expect to see full cost passthrough, such that a change in airport charges would result in higher ticket prices;
- Second, we highlight that in **a market with barriers to entry** we would expect to see little to no cost passthrough, meaning that ticket prices would be relatively unaffected by changes in airport charges; and
- Third, we highlight that there are significant barriers to entry at Heathrow – and these barriers have remained even since the start of the pandemic.

4.2 COST PASSTHROUGH WITH NO BARRIERS TO ENTRY

First, **in a competitive market with no barriers to entry** (where importantly barriers to entry in the context of airline competition includes the availability of take-off and landing slots at airports, which we discuss in more detail below) we would expect prices to reflect the long run marginal cost of providing the underlying good or service, such that any increase in cost would indeed be passed on to end consumers.

However, it is important to understand the economics of the airline sector and the nuances of cost passthrough. The chart below provides a high level overview of the airline business model.

FIGURE 21 AIRLINE BUSINESS MODEL



Source: Frontier illustration

- **Airlines set capacity:** Strictly speaking, in a theoretical sense, airlines do not independently set their own prices. Instead, they decide how much capacity to commit to a particular route for an upcoming season, in terms of the frequency (flights per week) and aircraft size (seats per departure). This decision needs to be made well in advance of the departure date – typically at least 6 months before the schedule comes into operation. Obviously, airlines chose this capacity with an expectation of the level of ticket prices they will be able to charge.
- **The market sets the price:** while airlines do need to publish their prices online, in effect it is really the market determining that price. Overall ticket prices will be driven by the balance of demand and the capacity decisions that all the airlines on a given route have made. If there is an abundance of spare capacity (demand is weak or overall airlines have been too bullish with capacity) on a given route, then ticket prices will fall. Conversely, if demand turns out to be higher than anticipated and seats become scarce, ticket prices will rise (this is similar to other markets which are categorised by short-run capacity-based competition). The airline must accept this market price and then hope to recover all of the costs that it needs to incur in order to provide the service – including airport charges, fuel costs, labour costs, and taxes, etc.. Therefore, in this dynamic, there is only an indirect link between cost and price. This is why in the airline sector we typically see higher prices at peak times of the day and the year, and passengers on the same flight paying different prices, even though underlying costs do not necessarily vary as much.

While acknowledging airlines often provide a breakdown of the total ticket price split out between taxes and airport charges, with the remainder being paid to the airline, these breakdowns need to be interpreted with caution. As set out above, it is not the case that an airline first decides its ticket prices and then adds the cost of airport charges and taxes on top. It is the market which determines the total price inclusive of all taxes and airport charges, with the airline then either making a loss or a profit on the route.

- **Over time and between seasons airlines will then adjust capacity based on profit signals:** if an airline were to make a large profit on a particular route – and these higher profits were expected to continue in future, as opposed to being the result of a temporary change in the market (e.g. a sharp change in fuel costs) – then, if there were no barriers to entry, we would expect capacity to increase on the route, driving down prices. This could either be in the form of competitors entering the route, or the incumbent increasing capacity to ward off new entry.

In practice, this competitive dynamic of capacity adjustment in response to changes in profitability does not happen instantly and there are frictions and real world considerations. For instance, as noted, airlines need to commit to their schedules at least 6 months in advance, while most, if not all cost elements other than airport charges are constantly moving targets.

Given these market dynamics, if airport charges were expected to increase, and this was known well enough in advance for airlines to be able to change their capacity decisions, then all things being equal, this would reduce the expected profitability on the route. In response, airlines would decide to reduce capacity, which would increase the scarcity of seats on the market, and push up prices, bringing airlines back to normal levels of profitability. In this sense, the increase in airport charges would be passed through to passengers, but again there would not be a direct link.

As noted earlier, we might expect the 40% increase in airport charges at Heathrow in 2022 to increase airline costs by around 1%-2%, based on costs in 2019. If passed on in full, we might expect a 1%-2% impact on ticket prices.

4.3 THE EFFECT OF BARRIERS TO ENTRY

The effects described above can be expected to function in unconstrained markets. *In a market with capacity constraints or barriers to entry*, the dynamic of capacity adjusting to changes in profitability can no longer work as fluidly, as there is a limit to the amount of capacity which can be provided. In the context of airline competition, this arises when there are no slots available for new entrants.

Under these conditions, faced with excess demand, and little to no threat of entry from competitors (or the ability for incumbents to increase their own capacity) airlines are able to set ticket prices above cost, at the level necessary to price the excess demand out of the market. This increase in price above cost is known as the ‘congestion premium’ (or ‘scarcity rent’). This is illustrated below. This dynamic also occurs in many other markets - including housing, hotels, and tickets for major events.

We note that the airport simply being full does not itself result in a premium. Importantly, there also needs to be *differentiation*, otherwise any increase in price would simply result in passengers (and airlines) switching to other airports. (We describe in more detail below how Heathrow is differentiated, meaning that a premium can arise in the event of excess demand.)

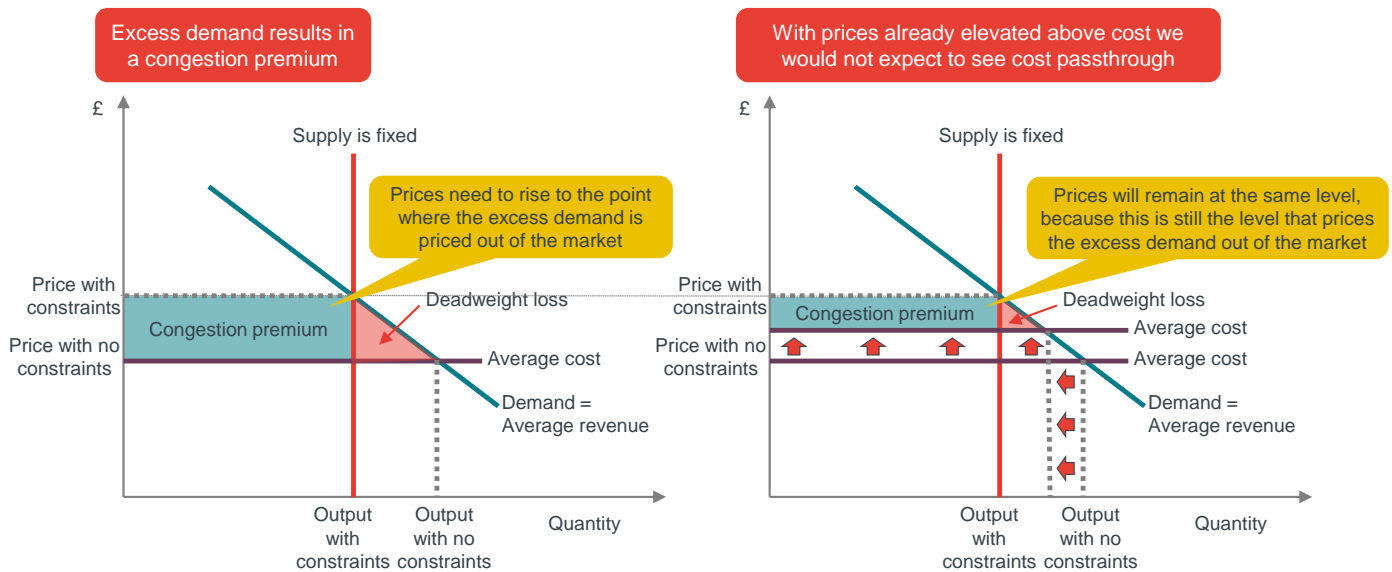
Also, even within a constrained airport, there is still some scope for intra-airport airline competition - i.e. incumbent airlines already present at the airport can switch capacity across routes in responses to changes in profitability. And airlines can also increase capacity by increasing load factors, operating larger aircraft, and switching short haul connections for larger capacity long haul connections. But ultimately, in a constrained world, this can only go so far. (We also discuss this point in more detail in the context of Heathrow below.)

The fact that prices are elevated above cost also results in the two forms of consumer harm discussed earlier in the context of price regulation at Heathrow:

- **Deadweight loss:** This relates to the group of passengers who are priced out of the market. They would be able to fly in the absence of capacity constraints, but can no longer afford to fly with the elevated prices.
- **Loss of consumer surplus:** The passengers who continue to fly end up paying more than they would compared to a scenario where there was spare capacity, and they have less money to spend on other things.

When prices are already elevated above cost we would not necessarily expect to see any cost passthrough - unless the increase in cost was greater than the premium. On the one hand, this protects passengers from cost increases, as the cost is effectively borne by the airline instead. However, clearly this only arises because **passengers were already paying a premium above cost in the first place**. This dynamic is illustrated below.

FIGURE 22 WHEN THERE ARE BARRIERS TO ENTRY, TICKET PRICES ARE EXCESSIVE AND UNRELATED TO COST



Source: Frontier illustration

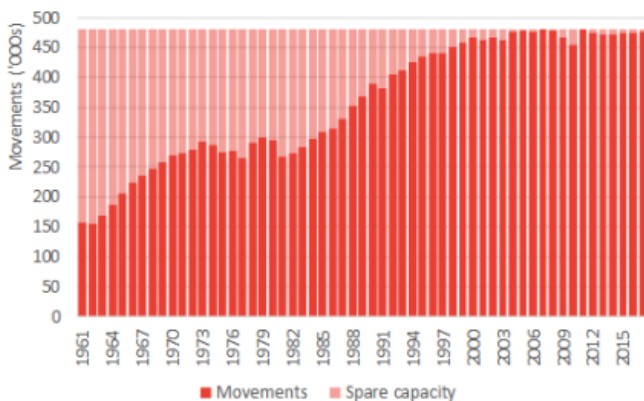
4.4 THERE ARE SIGNIFICANT BARRIERS TO ENTRY AT HEATHROW, EVEN TODAY

4.4.1 PRIOR TO THE PANDEMIC HEATHROW WAS CONSTRAINED

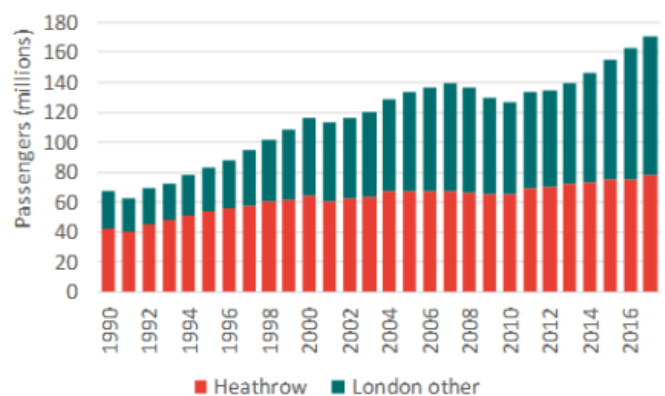
Heathrow has two runways and capacity for 480,000 movements (arrivals or departures) per annum. Before the pandemic, Heathrow had been operating at full capacity - in terms of runway utilisation - since the mid-2000s. With no spare capacity at Heathrow, the vast majority of the increase in demand to fly to and from London was largely taking place at other airports in London.

FIGURE 23 PRIOR TO COVID, HEATHROW WAS CAPACITY CONSTRAINED

Heathrow was capacity constrained



Heathrow was growing at a constrained rate

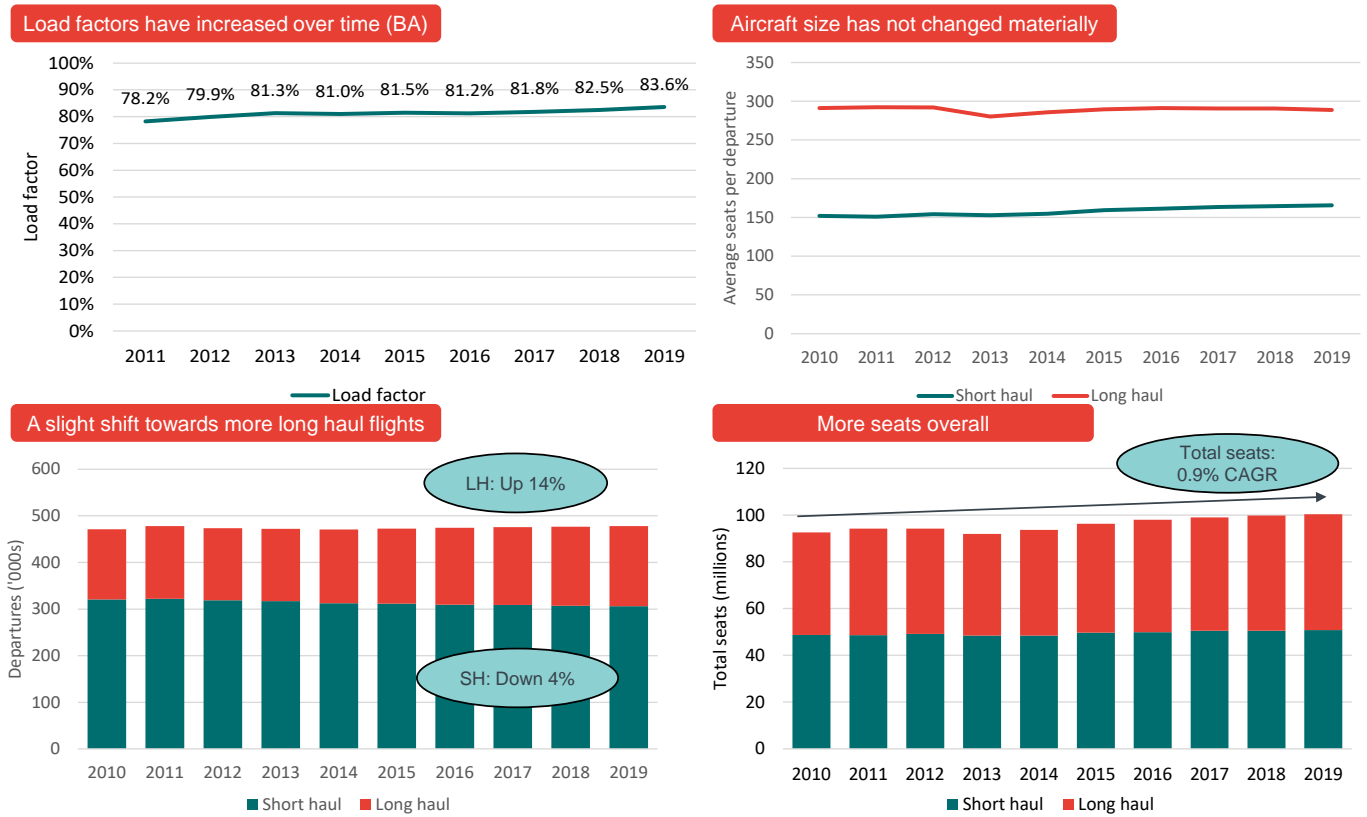


Source: Frontier analysis of OAG and CAA data

Airlines at Heathrow were still able to increase total passenger volumes over time - e.g. by increasing load factors, operating larger aircraft, and dropping short haul connections in favour of larger capacity long haul

connections. But with no room for more flights, total capacity at Heathrow was only able to grow at an extremely constrained rate. This is shown below.

FIGURE 24 CAPACITY WAS ONLY ABLE TO INCREASE AT A CONSTRAINED RATE



Source: Frontier analysis

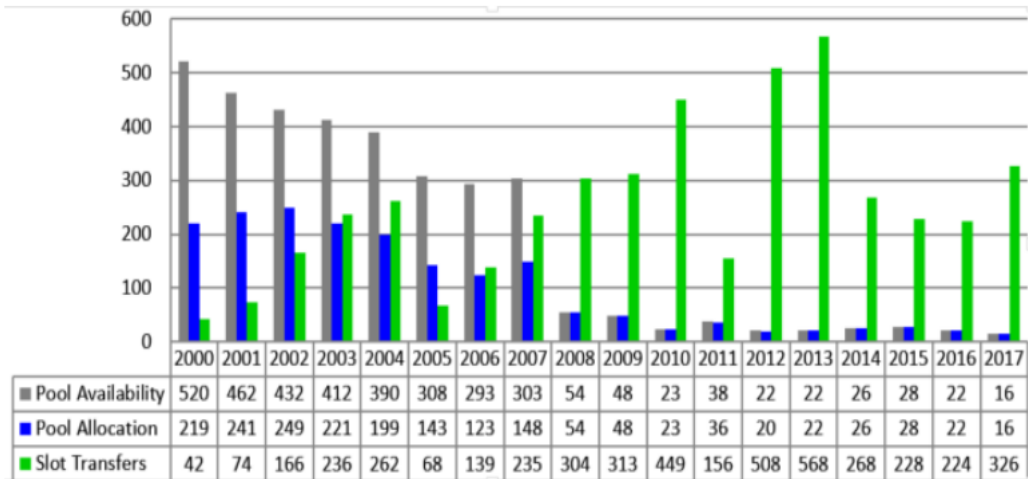
In principle, slots at Heathrow (i.e. the permission to land and take-off at a specific time on a specific day for a 6 month season) could be allocated to airlines in many different ways. In practice, as at all major slot-constrained airports, they are allocated in line with IATA’s Worldwide Slot Guidelines⁴⁵, and in particular the ‘80/20 use it or lose it’ rule which results in ‘grandparenting’ of rights to the current holders.⁴⁶ Historically, if an airport had spare capacity, an airline interested in flying to or from that airport was simply able to acquire a pair of slots (i.e. one for landing, and one for take-off) ‘for free’. Once an airline holds a slot, it is allowed to continue holding the slot for the subsequent 6 month season⁴⁷, as long as it actually used the slot at least 80% of the time in the previous 6 month season. If the airline does not meet this 80% rule, it relinquishes the slot, with that slot then entering back into the ‘pool’ and made available for other airlines. The chart below highlights that historically virtually no slots were available through the pool at Heathrow – although there were some slot transfers – i.e. airlines buying slots of incumbents at the airport, which we discuss in more detail below:

⁴⁵ <https://www.iata.org/en/policy/slots/slot-guidelines/>

⁴⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01993R0095-20200401&from=EN>

⁴⁷ To help coordinate slots globally, airline schedules are split into two 6 month seasons: (i) Summer (April to September); and (ii) Winter (October to March).

FIGURE 25 VERY FEW SLOTS ARE AVAILABLE AT HEATHROW



Source: Heathrow data

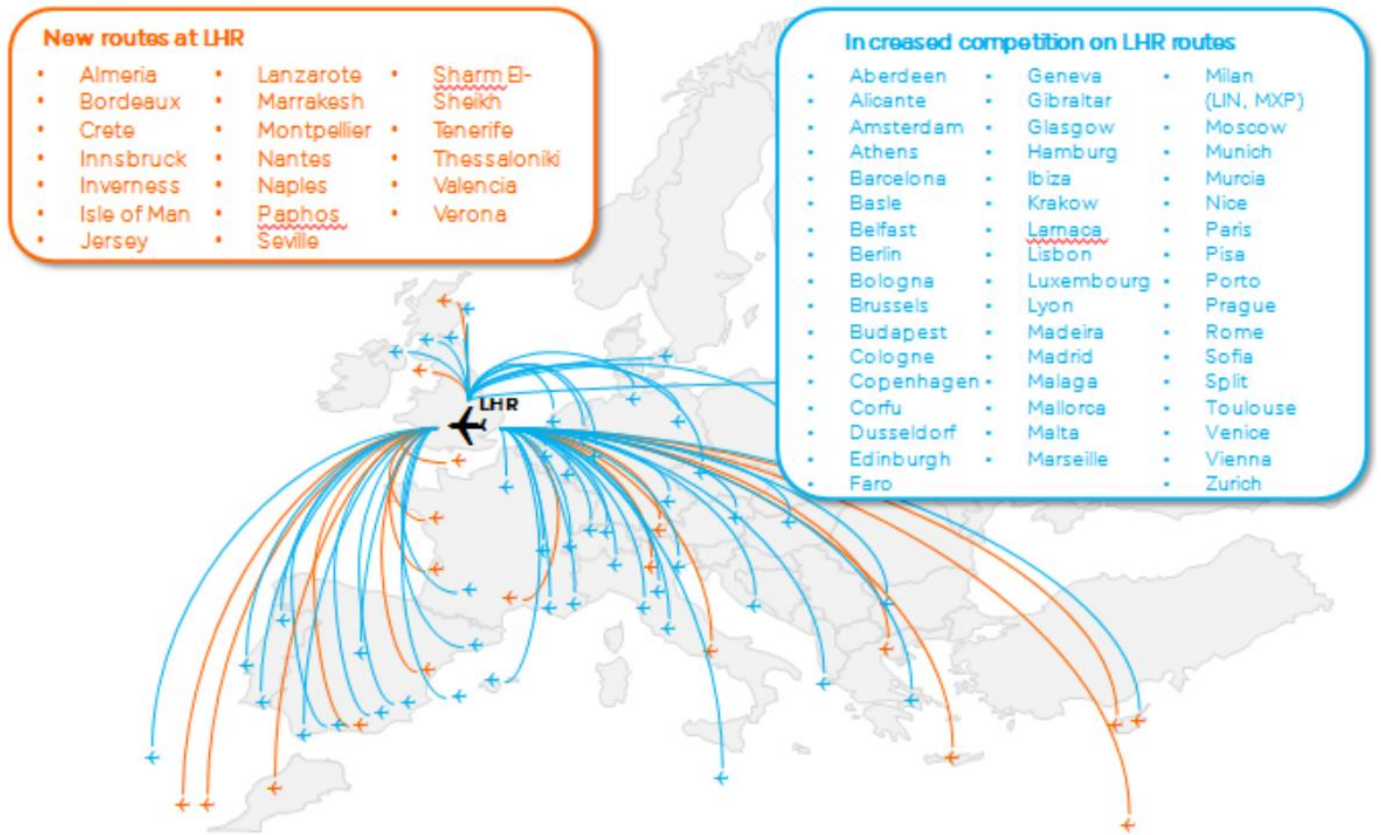
Notes: Heathrow has an annual cap of 480,000 movements a year, which equates to around 18,500 daily slots - i.e. 9,200 slots per week x 2 seasons. Therefore, the 16 pool slots available in 2017 equated to 0.09% of total slots

Given that - prior to the pandemic - Heathrow was virtually 100% full, this meant access to slots was effectively a barrier to entry for any new airlines wishing to enter. For instance, easyJet - which is not present at Heathrow - has publicly stated on many occasions that it would like to enter Heathrow if it were possible. And in the event of expansion at Heathrow it has set out its ambitions to enter, adding capacity onto existing connections (which would reduce prices on those routes) and to add new connections too.⁴⁸

⁴⁸ <https://corporate.easyjet.com/~media/Files/E/Easyjet/pdf/about-easyjet/easyjet-response-to-the-airports-commission-consultation-jan2015.pdf>; <https://www.independent.co.uk/travel/news-and-advice/easyjet-flights-heathrow-gatwick-slots-b1724885.html>

FIGURE 26 EASYJET'S PUBLISHED PLANS TO ENTER HEATHROW IN THE EVENT OF EXPANSION

Figure 5: Indicative easyJet network from Heathrow

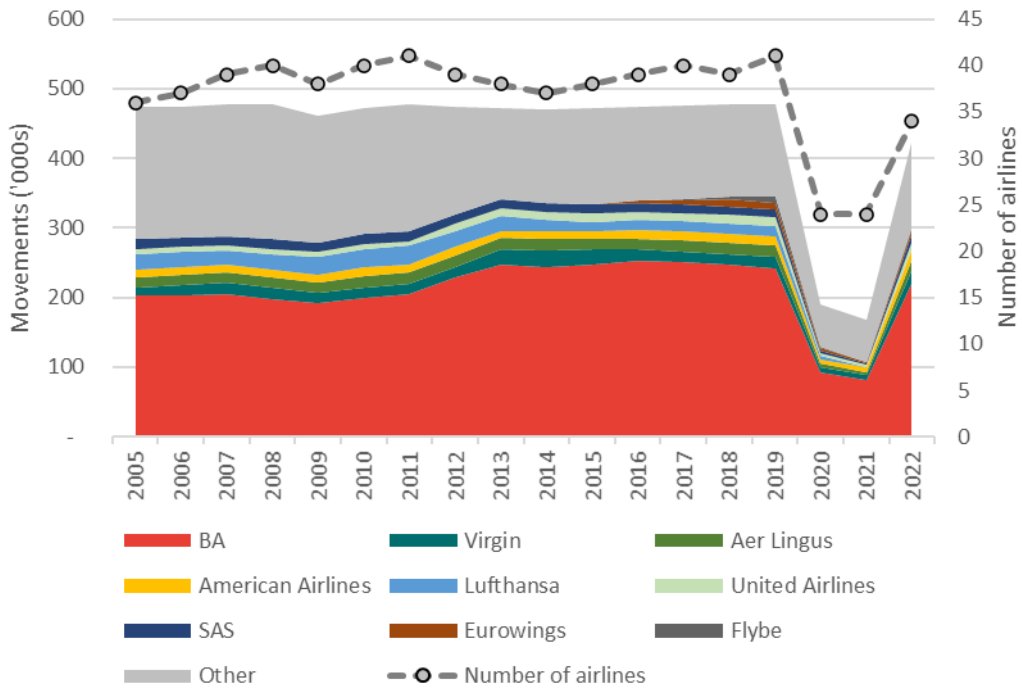


Source: easyJet's submission to the Airports Commission

However, with all slots at Heathrow already 'controlled' by incumbent airlines, this sort of entry is simply not possible.⁴⁹ The chart below reports the market share of airlines at Heathrow over time, measured as their share of total movements. It also reports the number of airlines present at the airport, where we count an airline only if it had a daily pair of slots (i.e. 365 x 2 slots per annum).

⁴⁹ Airlines can buy slots from each other - which we discuss in more detail below. Also, there have been instances of some new airlines entering Heathrow, but these tend to be during off-peak times, and not to any material significant extent.

FIGURE 27 MOVEMENTS BY CARRIER AT HEATHROW



Source: Frontier analysis of OAG data

5 CAPACITY CONSTRAINTS HAVE LED TO A PREMIUM IN TICKET PRICES AT HEATHROW

5.1 INTRODUCTION

In this section we discuss the evidence that there is a premium in ticket prices at Heathrow. Also, we note that passenger ticket prices represent only part of the value of Heathrow's slots for airlines, because cargo revenue can also be substantial. Heathrow had a 62% share of UK airfreight exports in 2019.⁵⁰ Moreover, Heathrow experienced a 650% increase in cargo revenues between 2019 and 2020, illustrating how airlines were able to increase cargo operations in response to the fall in passenger demand during the pandemic.⁵¹

We discuss the price premium at Heathrow in the following sections:

- A premium can arise at Heathrow because Heathrow is differentiated from other airports
- The premium may vary between passenger and route types
- There is evidence that there was previously a premium at Heathrow
- Since the start of the pandemic, a lack of available slots remains a barrier to entry even though Heathrow is not full
- We still find evidence of a premium in 2020 and 2021
- For 2022, the 70/30 rule will impact more on the market than Heathrow's airport charges

5.2 HEATHROW IS DIFFERENTIATED FROM OTHER AIRPORTS

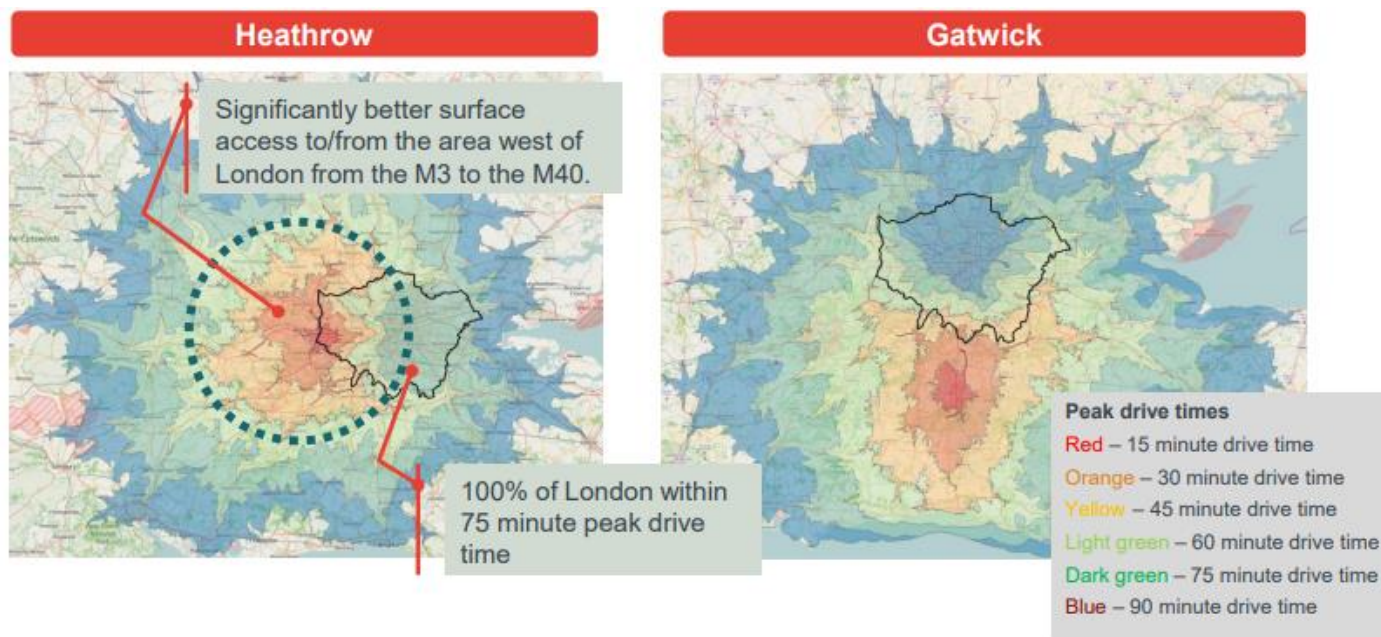
As noted earlier, when demand exceeds available capacity, prices must rise to price the excess demand out of the market. However, simply being full does not result in a premium. There also needs to be differentiation. If passengers (and airlines) were to view the other airports in London as perfect substitutes for Heathrow, then airlines would not be able to set higher ticket prices at Heathrow, however large the theoretical demand to use the airport, because any increase in ticket prices would simply result in demand switching away to other London airports with spare capacity. But if passengers (or airlines) consider Heathrow to be significantly differentiated then it will take a premium on ticket prices for traffic to be diverted to alternative airports. There are many reasons to believe that Heathrow the level of differentiation required for a premium to arise in response to congestion:

- Location: First, all airports have some degree of differentiation due to their location. We expect passengers to have a strong degree of preference for their local airport, all things being equal.
- Surface access: Heathrow is particularly well-connected with public transport and roads, and has the largest drive time boundaries compared to the other London airports. For instance, 100% of London lies within a 75 minute peak drive time of Heathrow, whereas for Gatwick, large parts of north London lie beyond a 75 minute peak drive time. Heathrow is also accessible on the Piccadilly Line and the Elizabeth Line.

⁵⁰ CAP2266A - Review of H7 Opex and Commercial Revenues: Initial Assessment and Forecasts, CEPA Taylor Airey, October 2021

⁵¹ Ibid, and <https://www.aircargonews.net/airlines/heathrow-to-boost-cargo-capacity-in-the-fight-against-covid-19/>

FIGURE 28 HEATHROW IS BEST PLACED TO SERVICE LONDON DEMAND



Source: Quod analysis for Heathrow

- **Service quality:** Heathrow is recognised as having the best service quality out of the London airports. For example, since 2011, Heathrow has appeared in Skytrax's Top 20 'best airports in the world' for service quality, outperforming the other London airports in all years.⁵²
- **Hub operations:** Heathrow is a large hub and the UK's main gateway for long haul destinations. In 2019, over 80% of all long haul flights departing from London airports departed from Heathrow. The hub and spoke model helps to boost the viability of long haul connections, as transfer passengers can help supplement local demand to boost overall demand for long haul flights. These hub operations create network effects that make it difficult for airlines to relocate long haul services to other airports without large volumes of transfer passengers. As a result Heathrow is often the only airport in London where a direct long haul connection can be found.
- **Slot transfers:** It is interesting to note that airlines at Heathrow have paid significant sums to buy slots from other airlines – even though historically there has been plenty of spare capacity at other airports in London 'for free'. For instance, Oman Air bought a daily pair of peak slots at Heathrow for a record \$75 million in 2016.⁵³ In order for such transactions to make commercial sense, an airline must expect to earn a premium over time which goes on to exceed the slot transfer price in net present value terms. If there were no premium, then buying a slot for large sums of money would simply be loss-making.

Even with barriers to entry, there is still some intra-airport airline competition. This may limit the ability of one airline to increase ticket prices on a particular route, as other airlines already present at the airport may be able to switch capacity onto that route, which would drive down prices. However, this type of competition can only go so far. First, switching capacity from one route to another clearly reduces capacity on the former route, increasing prices there. And secondly, prior to the pandemic – Heathrow had been full since the mid-

⁵² <https://www.worldairportawards.com/worlds-top-100-airports-2020/>

⁵³ <https://www.thetimes.co.uk/article/oman-breaks-heathrow-record-with-deal-for-slots-5mhd1zs23mn>

2000s. With demand increasing year on year, there comes a point where there is simply not enough capacity to satisfy demand on all routes at the airport. For instance, Virgin Atlantic commented that “We have 5% of the slots and we want 15%. There are 18.5 million passengers at Heathrow flying on monopoly routes who could have lower fares.”⁵⁴ And as demand increases year on year (as was the case prior to the pandemic) we would expect this premium to increase over time.

5.3 THE PREMIUM MAY VARY BY PASSENGER AND ROUTE TYPE

The premium would not necessarily arise for all passengers. Specifically, we might expect airlines to be more able to charge a premium to point-to-point passengers at Heathrow, and less able to charge a premium to transfer passengers. This is because, for transfer passengers, airlines at Heathrow also face competition from airlines at other hubs – although the level of competition may vary from route to route, where for point-to-point passengers this is less of an option. For beyond passengers (i.e. passengers flying to or from Heathrow in one or more stops), the ability to charge a premium may lie somewhere in between. Similarly, we might expect the premium to be lower for short haul destinations, as airlines at Heathrow face a greater degree of competition from airlines at other London airports, which as noted above is less likely to be the case for long haul.

5.4 THERE IS EVIDENCE THAT THERE WAS PREVIOUSLY A PREMIUM AT HEATHROW

We have estimated the congestion premium at Heathrow on a number of occasions. In our 2019 report⁵⁵ – our most recent work on the topic prior to this report – we estimated the premium using three separate approaches including a significant econometrics analysis of ticket prices. All three of these approaches pointed towards a premium of around 20% of ticket prices. This equates to over £30 per passenger for a return trip to a short haul destination, and over £200 per passenger for a return trip to a long haul destination. Across all point-to-point passengers at the airport, this equated to ticket prices being elevated by a total of around £2 billion per annum.

TABLE 3 WE ESTIMATED A CONGESTION PREMIUM AT HEATHROW OF AROUND £2 BILLION PRIOR TO THE PANDEMIC

APPROACH	DESCRIPTION	RESULT
Econometrics analysis	We compared ticket prices on individual routes at Heathrow over time with those at other London airports and large hubs in Europe. We controlled for other factors that impact on price, such as distance, share of low cost carriers (LCCs), share of business passengers, service quality, airline and airport competition.	Short haul: 14%-22% or c£30 per passenger per return trip Long haul: 22%-29% or c£220 per passenger per return trip Total: £2.4 billion per annum
Analysis of slot transfer prices	We identified instances where airlines bought slots at Heathrow from other airlines. We considered the financial assumptions you would need to make in	Total: £2 billion per annum

⁵⁴ <https://www.theguardian.com/business/2019/oct/23/heathrow-accuses-ba-acting-against-uk-consumer-interests>

⁵⁵ <https://www.caa.co.uk/media/dwfgyk53/estimating-the-congestion-premium-at-heathrow.pdf>

APPROACH	DESCRIPTION	RESULT
	order for the transfer to make commercial sense (e.g. discount rate, payback period)	
Top down analysis of passenger volumes	As Heathrow is full, its total passenger volumes have grown at a constrained rate for many years. Other airports in London have seen much higher growth rates, with demand to fly at Heathrow effectively overflowing to other London airports. We estimated how many passengers Heathrow would have handled if it had not been constrained. We then considered, using estimates of price elasticities of demand, how much ticket prices would have needed to have risen in order to price this excess demand out of the market	Premium of 25% Total: £2.6 billion per annum

The interpretation of this result is that passengers at Heathrow were collectively spending an extra £2 billion per annum on ticket prices compared to a scenario where Heathrow had spare capacity. Tellingly, BA, which is the largest operator at Heathrow, has historically opposed expansion at Heathrow, which would increase capacity by around 50%, of which 50% would be made available to new entrants. New entrants would include the likes of easyJet which has already signalled its interest to enter, with the remaining 50% allocated to incumbent airlines in line with their market shares.⁵⁶ In fact, when carrying out a cost-benefit analysis of expansion at Heathrow, the DfT estimated that one of the 'costs' was that over the period 2025-2085 (the time period considered in the DfT's analysis) airlines at Heathrow would miss out on £55 billion of profit in net present value terms.⁵⁷

This in part explains why airlines were prepared to pay significant sums to buy slots from incumbent airlines at Heathrow, even though there were slots available 'for free' at other London airports.⁵⁸ In other words, they must believe that the premium they can earn operating at Heathrow over time is greater, in net present value terms, than the transfer fee paid.

FIGURE 29 SLOT TRANSFERS AT HEATHROW

Date	Purchaser	Previous Owner	Daily Slots	Total Price	Av. Price per daily slot
Feb-13	EY	9W	1x early am, 2x pm	\$70m	\$23.3m
Aug-14	EY	AZ	3x pm, 2x evening	€60m	€12m
Feb-15	TK	SK	1x pm	\$22m	\$22m
Feb-15	AA	SK	1x early am	\$60m	\$60m
Oct-15	DL	AF/KL	6x am/early pm	\$276m	\$46m
Feb-16	WY	AF/KL	1x early am	\$75m	\$75m
Jan-17	DL	OY	5/wk am	\$19.5m	\$27.3m
Mar-17	AA	SK	1x am, 1x early pm	\$75m	\$37.5m

Source: Data provided by Heathrow

⁵⁶ <https://www.economist.com/gulliver/2015/08/04/bas-big-bluff-on-a-third-runway-at-heathrow>

⁵⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/711589/addendum-to-the-updated-appraisal-report-airport-capacity-in-the-south-east.pdf See Table 3.1

⁵⁸ For instance, Oman Air bought a daily pair of peak slots at Heathrow for a record \$75 million in 2016. <https://www.thetimes.co.uk/article/oman-breaks-heathrow-record-with-deal-for-slots-5mhdz23mn>

To help put this £2 billion figure into perspective, we would highlight that, prior to the Covid-19 pandemic, Heathrow’s total allowed aeronautical revenue (i.e. the CAA’s determination on the maximum allowable yield per passenger multiplied by its passenger forecast) was on the order of £1.6 billion per annum. In other words, the premium at Heathrow was actually larger than the combined airport charges paid by airlines at the airport. The premium represented a much larger proportion of a passenger’s ticket price (c20%) than Heathrow’s airport charge (c2.5%-5% based on BA’s 2019 annual report).

In 2019, the CAA commissioned a review of the congestion premium at Heathrow. Ultimately, it accepted that there was a premium, noting that “we consider that it is likely that some airlines are earning scarcity rents [a congestion premium] at Heathrow” and argued that assuming a premium in the range of “£0.9 billion-£2.5 billion per annum” was “conservative”.⁵⁹ The table below presents the evidence considered by the CAA in coming to this conclusion. Also, we note that in the DfT’s cost benefit analysis of expansion at Heathrow described above, it identified the single biggest benefit of expansion as ‘lower fares’ for passengers worth around £64 billion in net present value terms over the period 2005-2085 – in other words, expansion would allow for more capacity which would help alleviate the premium.

FIGURE 30 THE CAA RECOGNISED THE PREMIUM IN 2019

Table C.1: Summary of evidence

Source	Description	Estimate of congestion premium
University of Leeds (July 2019)	Critical review of existing studies	n/a
Frontier Economics (May 2019)	Empirical estimate	£2.0bn-£2.4bn p.a.
RBB (February 2019)	Critical review of existing studies	n/a
FTI Consulting (October 2018)	Critical review of existing studies	n/a
SEO Economic Research (2017)	Empirical estimate	£1.8bn-£5.4bn p.a.
EY (September 2017)	Estimate of airline profitability	£6.7bn p.a. (upper bound)
Airports Commission (2015)	High-level view of scarcity rents	n/a
Additional evidence considered	Empirical estimate	£0.9bn-£2.5bn p.a.

Source: CAA <https://publicapps.caa.co.uk/docs/33/CAP1871%20Early%20expansion%20costs%20condoc%20v1.6.pdf>

We would stress that the premium we have observed is not necessarily all profit to airlines, as they may incur some higher costs operating at a congested airport, such as aircraft circling in the air waiting for a slot

⁵⁹ <https://publicapps.caa.co.uk/docs/33/CAP1871%20Early%20expansion%20costs%20condoc%20v1.6.pdf>

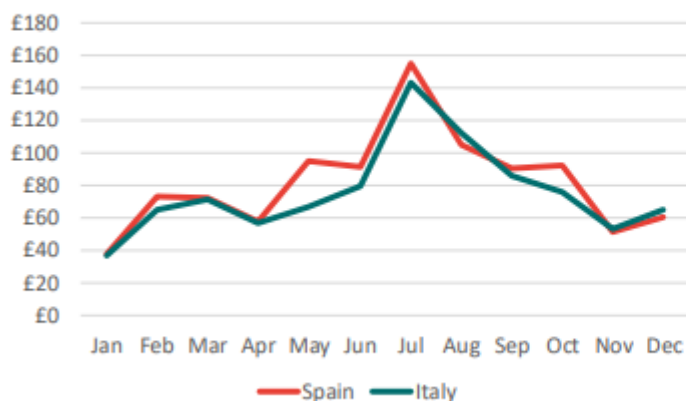
to land. However, Heathrow has been full for many years, meaning we would expect operations to become more efficient over time, reducing these additional operating costs. Also, the premium was likely growing over time as unserved demand was growing, whereas congestion per se was not – i.e. once the airport is 100% full, in terms of flights, it cannot really become more full even as the unserved demand grows. Moreover, regardless of whether operating costs are higher or not, it still follows that prices would have been lower if there was no congestion.

We have often heard the idea of a premium at Heathrow being dismissed on the grounds that there is a high proportion of business passengers at Heathrow who have a high willingness to pay for flights. However, it is important to note that there is a distinction between willingness to pay and the price that we would expect to see in a competitive market with no barriers to entry. If a route served only business passengers with a very high willingness to pay, it is true that an airline could earn very large profits. But if there was spare capacity, we would expect competition (or the threat of new entry) to result in extra capacity being added onto the route, such that this excess profitability would be competed away to the point where prices reflected the long run marginal cost of providing the service, and airlines earned normal profits, irrespective of willingness to pay. For a premium to exist, clearly there needs to be passengers willing to pay a premium. But this premium only materialises if there is no spare capacity and therefore a limited threat of entry.

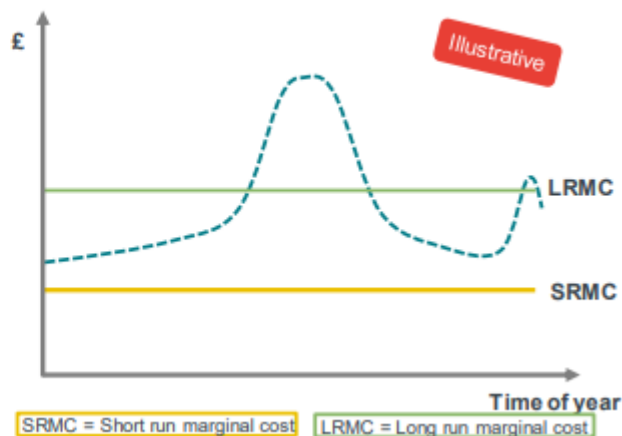
Finally, the congestion premium at Heathrow should not be confused with the more general peak pricing observed at many unconstrained airports during peak times of the day or peak times of the year. By way of illustration, the chart below, based on 2018 data, shows the average price of a one-way ticket from the UK to Spain and Italy, the two most popular destination countries for UK passengers. This includes all airports in the UK (and not just Heathrow) to all airports in Spain and Italy.

FIGURE 31 PEAK PRICING IS A NORMAL FEATURE OF THE AIRLINE SECTOR – THE CONGESTION PREMIUM GOES BEYOND THIS PEAK PRICING

Average ticket price from the UK to Spain and Italy in 2018



In the long run, airlines must recover all costs



Source: Frontier analysis of OAG data

Note: The chart on the right is for illustrative purposes only

It shows that prices were lowest in January and highest in July. A broadly similar pattern is observed across many other destinations served from the UK. This pattern is a natural feature of the airline business. Airline capacity remains broadly fixed throughout the year, but demand varies. With a fixed amount of capacity, airlines need to lower prices during quieter periods to stimulate demand, and then increase prices during peak periods to suppress demand. While price may vary, operating costs remain broadly similar, aside from any seasonal variation in airport charges or increased costs during peak periods, etc.. This means that profitability varies over the course of the year. But this can still be consistent with a competitive market:

- During quieter periods, airlines' excess capacity results in lower ticket prices being set in the market. Airlines will continue to operate these flights provided ticket prices cover the short run marginal cost (SRMC) of operating these flights. This includes airport charges, taxes, fuel, and labour costs for cabin crew and pilots, etc.. While this makes a cash contribution to the business, it may make little to no contribution to the recovery of fixed costs such as aircraft or head office costs.
- During peak times, seats are more scarce and ticket prices increase. It is during these periods that airlines recover their long run marginal cost (LRMC) which includes fixed costs.

The higher prices observed during the summer months compared to the lower prices in winter reflect a premium of sorts. But this pattern occurs at airports which are not congested, and simply reflects the balancing act airlines must perform to recover their costs in total, over peak and off-peak times. But the premium observed at highly congested airports – including Heathrow prior to the pandemic – goes beyond this pattern. Rather than demand exceeding capacity for just a few weeks of the year, the situation is chronic.

5.4.1 SINCE THE START OF THE PANDEMIC, A LACK OF AVAILABLE SLOTS REMAINS A BARRIER TO ENTRY EVEN THOUGH HEATHROW IS NOT FULL

Clearly, since the start of the pandemic, Heathrow is no longer full. Based on the CAA's passenger forecast, this is expected to be the case for large parts (if not all) of H7. In its Revised Business Plan Update 2, Heathrow itself forecasts a full recovery in terms of movements (i.e. flights) by 2024, and a full recovery of passengers at a later point in 2024.⁶⁰ Therefore, until Heathrow returns to full capacity it seems difficult to argue that there is still a *congestion* premium at Heathrow per se. However, the approach to slot allocation since the start of the pandemic means that there continues to be no scope for any new entry at Heathrow to any meaningful extent.

In response to the Covid-19 pandemic, the UK Government (along with other governments) decided to temporarily suspend the 80/20 slot allocation rule. This meant that airlines could reduce their operations at Heathrow without relinquishing their slots. After initially suspending “use it or lose it” entirely, a 50/50 rule was reintroduced for the Winter 2021/22 season⁶¹ and a 70/30 rule for the Summer 2022 season.⁶² Therefore, the treatment of slot rights has continued to constrain new entry at Heathrow, even though strictly speaking there is spare physical capacity. And ultimately, we have not seen any new entry at Heathrow to any meaningful extent since the start of the pandemic.

Meanwhile, there have been instances of significant entry and exit at other airports across Europe, which generally do have spare capacity (i.e. prior to the pandemic, Gatwick and Schiphol were the only other airports in Europe that had significant ‘Heathrow-like’ levels of runway capacity constraints). For instance, based on analysis of OAG data, Ryanair is planning to add 5.5 million seats at Vienna Airport in 2022 (it was not present at the airport prior to the pandemic), an extra 3 million seats at Rome Fiumicino relative to 2019, and 2.3 million seats at Stockholm Arlanda (it was not present at the airport prior to the pandemic). This sort of entry has not been possible at Heathrow.

This concern about slots continuing to form a barrier to entry, even since the start of the pandemic, has been echoed by others in the sector. When the 80/20 rule was first relaxed, Gatwick's CEO commented that “it is

⁶⁰ <https://www.caa.co.uk/media/103hju3k/a20-rbp-update-2-redacted.pdf>

⁶¹ [https://hansard.parliament.uk/Lords/2021-10-19/debates/2E334E01-24AA-4C01-B189-AFE1F714AD17/AirportsSlotAllocation\(AlleviationOfUsageRequirements\)\(No2\)Regulations2021](https://hansard.parliament.uk/Lords/2021-10-19/debates/2E334E01-24AA-4C01-B189-AFE1F714AD17/AirportsSlotAllocation(AlleviationOfUsageRequirements)(No2)Regulations2021)

⁶² <https://www.gov.uk/government/news/government-supports-aviation-sector-recovery-with-airport-slot-alleviation-for-summer-2022>

vital that the industry reverts back to using the 80/20 slot rule for the start of the summer season...[to] ensure that the aviation market is competitive and airlines are incentivised to trade or hand back unused slots so that other airlines can fly them instead, including new market entrants.” This came amid reports at the time that Wizz Air was looking to significantly increase its operations at Gatwick, but was unable to do so.⁶³

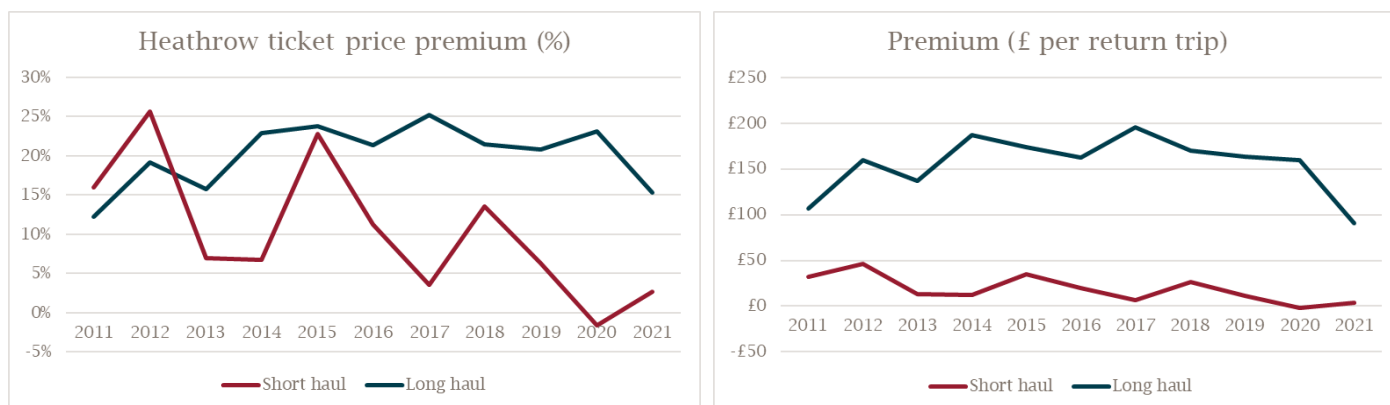
5.5 WE STILL FIND EVIDENCE OF A PREMIUM IN 2020 AND 2021

As part of this report, we have updated our econometrics analysis of ticket prices at Heathrow. This involves comparing ticket prices on individual routes at Heathrow over the period 2019-2021 (data on prices in 2022 was not yet available at the time of the analysis) with ticket prices on routes at the other airports in London and at the 10 largest airports in Europe, and then controlling for various factors that can explain legitimate differences in price (e.g. share of LCCs and share of non-economy class seats).

First, a simple high level comparison shows that ticket prices at Heathrow were generally much higher than those at the other airports in the sample. However, clearly, part of this ‘raw’ premium can be explained by a number of legitimate reasons. For instance, compared to other airports, there is a very low presence of LCCs at Heathrow (e.g. Ryanair, easyJet and Wizz Air do not operate there), and many airlines at Heathrow offer premium economy, business class and first class seats, which have a higher cost to serve and understandably command higher prices.

We have sought to explain this ‘raw’ premium by adding in various explanatory variables (such as distance, share of LCCs⁶⁴, share of non-economy class passengers, service quality, airline and airport competition, airport charges, etc.). Controlling for these variables, we still find evidence of a premium in 2020 and 2021.

FIGURE 32 WE STILL FIND EVIDENCE OF A PREMIUM AT HEATHROW IN 2020 AND 2021



Source: Frontier analysis

Full details of our econometrics analysis can be found in Annex A.

- For long haul, we have found evidence of a premium of around 15%-23% for 2020 and 2021. This equates to around £90-£160 for a passenger making a return trip. This finding controls for various

⁶³ <https://www.ft.com/content/8d9bf01f-f31b-4d41-94a1-25305df04794>

⁶⁴ We are not suggesting that the absence of LCCs at Heathrow in itself results in a premium. Full service / network carriers do tend to have higher ticket prices than LCCs do. However, this is not unreasonable given that they specifically provide a service differentiated from that of the LCCs with a higher cost to serve. In a competitive market with no barriers to entry we would expect full service carriers to earn modest levels of economic profit, and LCCs to earn modest levels of economic profit, with full service carriers having higher prices, but due to their higher cost to serve, not due to a slot scarcity premium.

factors that impact on price – such as fuel costs, share of LCCs, share of business class – as well as the higher airport charges at Heathrow..

- For short haul, we do not find strong evidence of a premium once we control for other factors, including the higher airport charges at Heathrow. As noted earlier, this is perhaps because airlines at Heathrow face a greater degree of competition from airlines at other London airports. However, as set out below, the premium may re-establish itself once demand returns back to more ‘normal’ levels.

Given that we have controlled for the explanatory variables outlined above, the premium is therefore being driven by something else. Since the start of the pandemic there have been imbalances between supply and demand on individual routes which could explain high prices. However, this sort of dynamic would have impacted all airports in our sample. We argue that the difference relates to the fact that there are significant barriers to entry at Heathrow, which is not the case at the other airports (or at least not to the same extent). If new entry were possible at Heathrow, perhaps we would have seen entry from the likes of easyJet, Ryanair and Wizz Air, as well as extra capacity from incumbent airlines already present at the airport. This seems especially likely given that – as noted – airlines have historically paid up to \$75 million to acquire a daily pair of slots at Heathrow.

This premium is clearly not a *congestion* premium per se, as clearly Heathrow is not currently congested. However, both this premium and the premium estimated historically both arise due to the same fundamental issue. The scarcity of slots at Heathrow limits the amount of capacity and competition at the airport. Or in other words, if there was scope for new entry at the airport we might expect to see more capacity and therefore lower prices as a result.

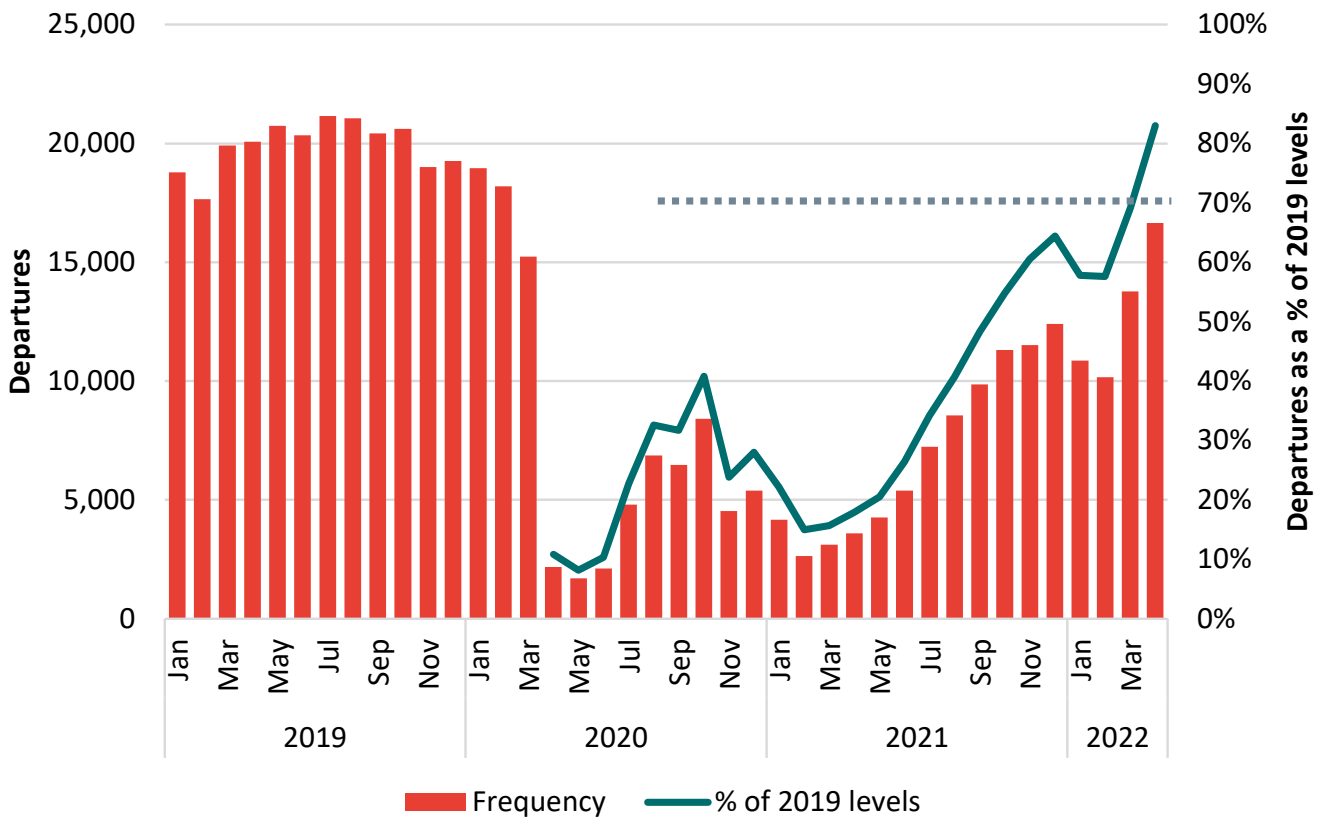
When interpreting the results for 2020 and 2021, it is obviously worth stressing that these were extremely unusual years for the sector, with demand at Heathrow falling from 80 million passengers in 2019 to 20 million in 2020 and 2021, and with sudden and unpredictable changes to restrictions. Therefore, to some extent, we need to be cautious about analysing ticket prices during this time, and the results may not tell us much about what the premium will look like going forward.

From the airlines’ perspective, there is an important point around timing and expectations around profitability over the medium term, rather than in just individual years. Even if there was no evidence of a premium at all in 2020 or 2021, if airlines anticipated that demand would return back to ‘normal’ levels, and the premium with it, they would be prepared to continue operating at Heathrow even at a loss in the short term in order to hold onto their slots and continue to earn the premium again in future. And there is clear evidence that this is happening.

5.6 FOR 2022, THE 70/30 RULE WILL IMPACT MORE ON THE MARKET THAN HEATHROW’S AIRPORT CHARGES

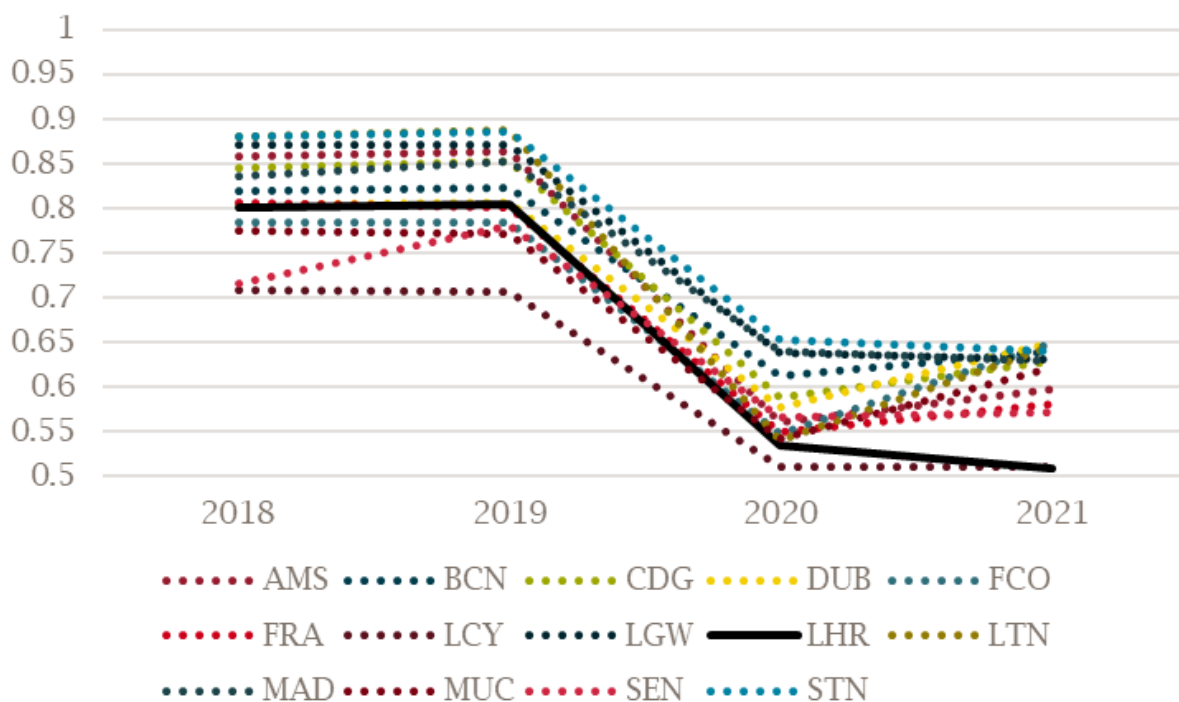
While Heathrow’s airport charges have increased by around 40% in 2022, it is important to note that the new ‘70/30’ slot allocation rule has also come into effect in the UK for the Summer 2022 season (which started at the end of March). This means airlines at Heathrow will be forced to increase their capacity and use their slots 70% of the time, or risk losing their slots. In Q1 2022, airlines were generally operating below this level, with total movements at around 62% of the level in Q1 2019. However, in April 2022 (the first month of the new rules coming into effect), the number of departures at Heathrow was at 83% of the level in April 2019, suggesting that airlines are indeed increasing capacity to protect their slots.

FIGURE 33 THE 70/30 RULE COMES INTO EFFECT FOR SUMMER 2022



It is worth noting that airlines have increased their capacity despite the fact that load factors in 2021 were particularly low. In 2021, airlines at Heathrow were operating with an average load factor of around 50%, suggesting that airlines could still accommodate a large increase in demand without increasing seat capacity. Therefore, the decision to increase capacity even with such low load factors suggests that airlines may be more concerned with protecting their slots rather than balancing supply and demand. It is worth remembering that airlines have the option to walk away from Heathrow and lose their slots, but even though demand and profitability is uncertain, and airport charges have increased by around 40%, we see no evidence of this.

FIGURE 34 AVERAGE LOAD FACTORS AT HEATHROW AND COMPARATOR AIRPORTS



Source: Frontier analysis of PaxIS passenger volumes and OAG schedules data
 Note: Load factors based on flights departing from the given airport

Given that incumbent airlines may reasonably expect the historical premium to re-establish itself once demand returns to pre-pandemic levels, airlines may well be prepared to increase capacity, rather than relinquish their slots, even if the growth in demand has not yet occurred, especially since slots at Heathrow were being transferred between airlines for tens of millions of pounds only a few years ago. All things being equal, this increase in capacity will actually result in **falling** ticket prices and short-term losses, but will enable airlines to earn premium ticket prices in the future.

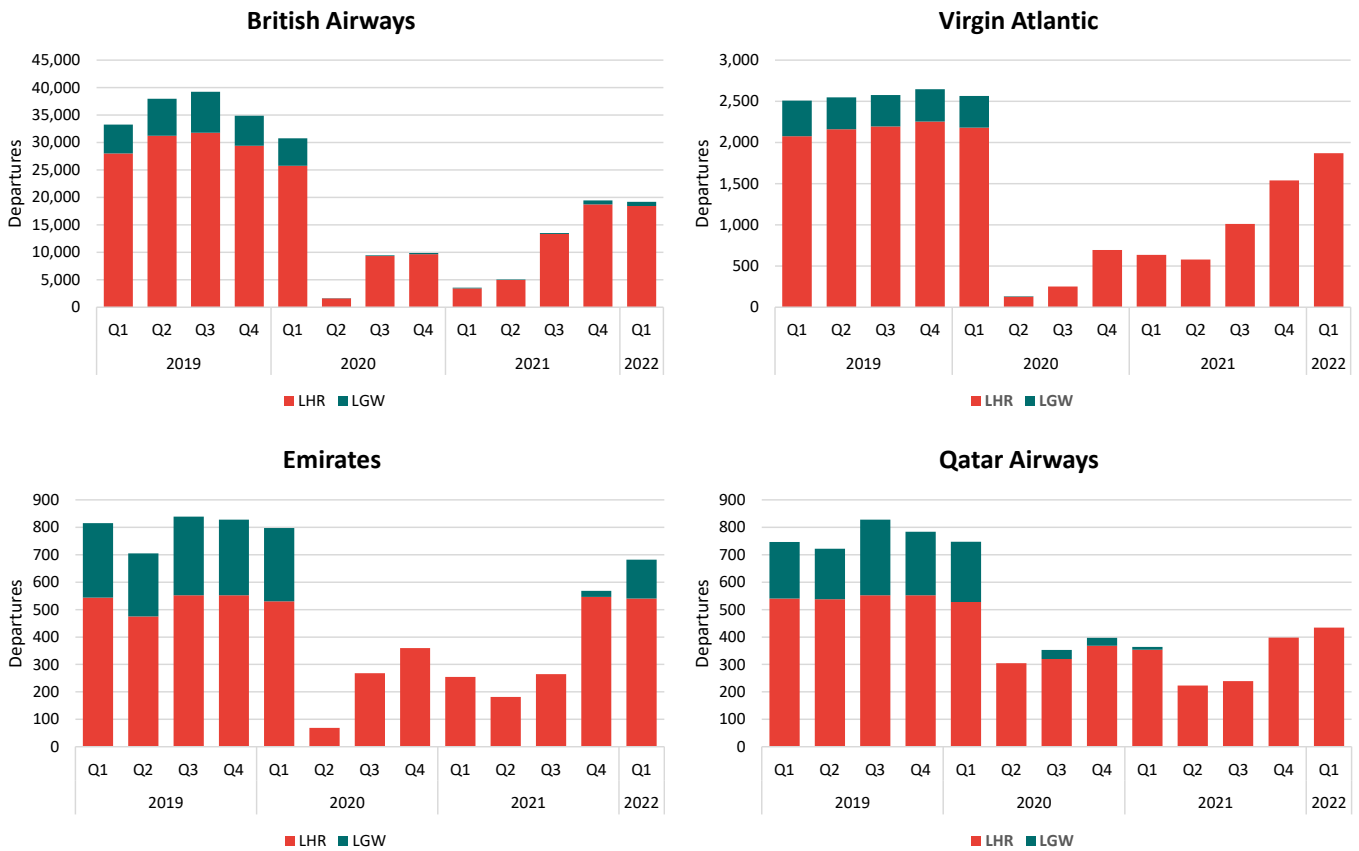
Increasing capacity from 62% of 2019 levels (as was the case in Q1 2022) to 70% (as per the 70/30 rule) equates to a c13% increase in total capacity. Using established price elasticities of demand - which tend to be in the order of -0.7⁶⁵ - this would suggest a downwards pressure on prices in the order of -10%. (However, over the course of 2022, demand will likely increase meaning that the net impact on prices will depend on this balance between supply and demand.) We note that airlines could use their slots by adding capacity on to new routes at Heathrow which would not drive down prices on existing routes. However, as set out in the next section, we see no evidence that the route network at Heathrow has been materially impacted by the higher airport charges.

Given this dynamic, it is difficult to argue that higher airport charges will be passed through to passengers, and there will certainly not be a direct link. As mentioned earlier, an increase in airport charges would only be passed through to passengers in the form of higher prices if airlines reduced capacity. However, given the 70/30 rule, we are actually seeing the opposite happening.

⁶⁵ For instance, see <https://www.iata.org/en/iata-repository/publications/economic-reports/estimating-air-travel-demand-elasticities--by-intervistas/>. We note that DfT has updated its econometric estimation of elasticities, and find that price elasticities are recently closer to -1. Our estimate of the downwards pressure on prices is therefore relatively conservative. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1061918/econometric-models-to-estimate-demand-elasticities-for-the-national-air-passenger-demand-model.pdf

It is also worth noting that some airlines operate at both Heathrow and Gatwick, and are therefore able to optimise their operations between the two airports. Since the start of the pandemic, several airlines have consolidated operations at Heathrow, as shown below. This includes BA, with some media reports suggesting that the decision to concentrate operations at Heathrow was to help protect the value of its slots there.⁶⁶ IAG’s CEO commented that “Gatwick is an important decision that we need to take as a group. It’s true that we have the issue with the slots... Gatwick has some strategic value, but we need to be competitive there. This crisis is going to change the profile ... of the demand. So we are analysing the different options.” Similarly, Virgin Atlantic ceased operating from Gatwick during the pandemic. At the time, it claimed it had an “ambition to rebuild Gatwick as demand returns”,⁶⁷ however despite demand increasing in recent months, Virgin Atlantic has since ruled out a return to Gatwick in 2022.⁶⁸

FIGURE 35 AIRLINES HAVE REBALANCED AWAY FROM GATWICK



⁶⁶ <https://www.airportwatch.org.uk/2021/06/british-airways-might-abandon-gatwick-for-heathrow-if-80-slot-use-rules-are-reinstated/>

⁶⁷ https://corporate.virginatlantic.com/content/dam/corporate/Virgin%20Atlantic%20Annual%20Report%202020_final%20v1.pdf

⁶⁸ <https://simpleflying.com/virgin-atlantic-no-plan-london-gatwick-return-202>

SUMMARY - HEATHROW'S HIGHER AIRPORT CHARGES WILL NOT BE PASSED THROUGH TO PASSENGERS

In the airline sector, there is not a direct link between cost and price. Airlines decide how much capacity to commit to a particular route many months in advance of the departure date, and then the market determines the price. If there is an abundance of spare capacity on a particular route, prices will fall, and conversely if there is a shortage of capacity, prices will rise. We would only expect to see Heathrow's higher airport charges passed through to passengers in the form of higher ticket prices if airlines were to reduce capacity on routes, which would increase the scarcity of seats and drive up prices to the point where the higher cost has been passed through to passengers.

However, we have not seen airlines reduce capacity. In fact, in 2022, airlines have significantly increased their capacity at Heathrow in order to comply with the '70/30' slot allocation rule, whereby airlines must use their slots at least 70% of the time over a 6 month period or lose those slots. The 70/30 rule came into effect at the end of March 2022. Before the new rule came into effect, airlines were operating below the 70% threshold, however in April 2022, airlines started operating above the threshold (with capacity increasing to 83% of April 2019 levels), even though load factors were particularly low in 2021. All other things equal, this increase in capacity will actually put a downward pressure on ticket prices.

Despite the fact that future demand and profitability is uncertain, airlines at Heathrow have increased their capacity to meet the 70/30 rule in order to hold onto their slots. Prior to the pandemic, we estimated (using several different techniques) that due to a lack of spare capacity at Heathrow and little to no threat of entry from new entrants, airlines at Heathrow were able to earn a 'congestion premium', worth around £2 billion per annum in the form of additional revenue. This explains why, prior to the pandemic, airlines were prepared to pay tens of millions of pounds to buy slots from other airlines in order to operate at Heathrow and earn these higher revenues, even though there were plenty of slots available 'for free' at other London airports. The CAA has also accepted that there was a premium at Heathrow. When prices are already elevated above cost we would not necessarily expect to see any cost passthrough - unless the increase in cost was greater than the premium (see Figure 22).

We have also found evidence of a premium on long haul routes in 2020 and 2021, but no premium on short haul routes. However, we would urge caution in interpreting the results for these years, as ticket prices are ultimately determined by the balance between supply and demand, and clearly 2020 and 2021 were particularly unusual years, and prices during these years are unlikely to tell us much about prices in future.

The need to comply with the 70/30 rule introduces an important point around profitability over the medium term. Airlines will be prepared to increase their capacity at Heathrow, in order to protect their slots, and potentially even operate at losses in the short term, in order to continue earning the premium again in future when demand returns. After all, airlines could have chosen to not increase their capacity at Heathrow and lose their slots. However, they have increased capacity, and there are various quotes in the public domain from airlines about the need to protect their slots at Heathrow, which would only make sense if they believed that they would continue to earn a premium in future.

Therefore, while Heathrow's airport charges have increased in 2022, the 70/30 rule can be viewed as the more significant development in the market (not to mention the increases in fuel prices and labour costs that we have also seen in 2022, which dwarf the increase in Heathrow's airport charges). Heathrow's airport charges would only be passed through to passengers in the form of higher ticket prices if airlines decrease their capacity on routes, however, they have actually increased their capacity in order to comply with the 70/30 rule. Therefore, the higher charges at Heathrow will not be passed through in the form of higher ticket prices.

6 ROUTE VIABILITY AT HEATHROW

Airlines have suggested that increased airport charges will challenge the economic viability of many routes at Heathrow.

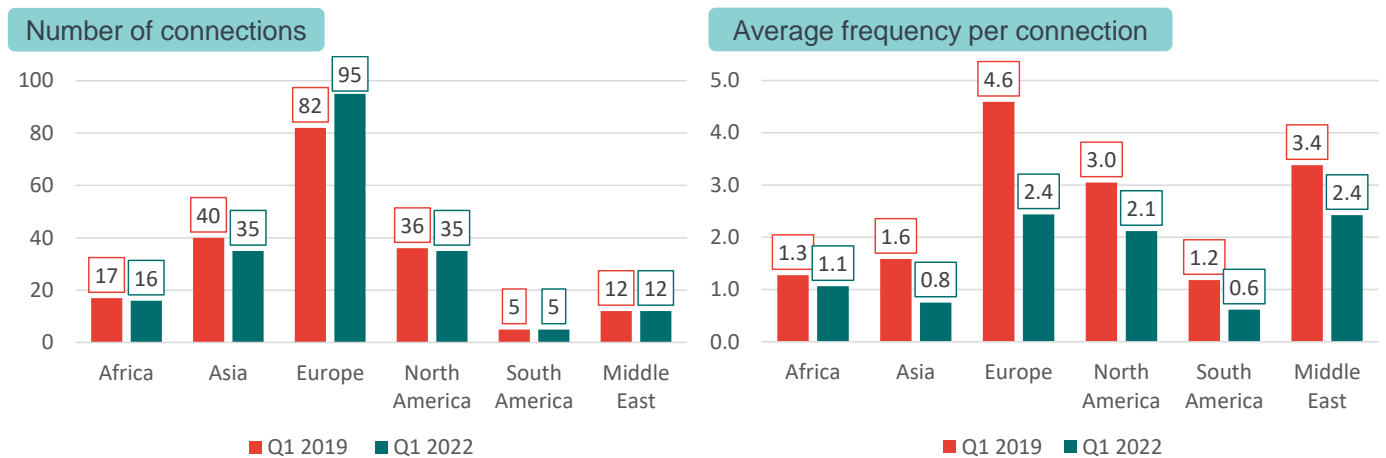
As discussed earlier, airlines appear to be focused on retaining their slots at Heathrow and have increased their capacity to satisfy the 70-30 rule even if the demand is not yet there in order to protect the value of their slots. This suggests that they expect the ticket price premium to return in future.

In this context we have examined the evidence from schedule data to see what effect, if any, the increase in airport charges in 2022 may have had on services offered this year, compared to pre-pandemic levels. Our analysis of schedules data suggests that this concern is not supported by the data:

- In Q1 2019, 192 connections operated at Heathrow, served with an average of 3.2 departures per connection per day; and
- In Q1 2022, 198 connections operated at Heathrow, served with an average of 1.93 departures per connection per day (i.e. around 60% of the Q1 2019 levels).

At the level of individual regions we also do not find any evidence to suggest that there have been material changes to the route network provided.

FIGURE 36 THE ROUTE NETWORK IS BROADLY THE SAME, BUT WITH LOWER FREQUENCY



Therefore, based on the evidence, it would appear that the increase in airport charges has not had a negative impact on the route network offered at Heathrow. The route network is broadly the same, but served with lower frequency.

7 CONCLUSION

The CAA is currently in the process of determining Heathrow’s maximum allowable yield per passenger for the H7 period, which covers 2022-2026. The CAA has made an interim decision for 2022 to increase airport charges by around 40% relative to charges in 2021. Airlines have raised concerns that Heathrow’s airport charges are unreasonable, that they will lead to higher ticket prices, and that route viability will be negatively impacted. In this report we have analysed a range of evidence to investigate these concerns, and ultimately we find that these concerns are not supported by the evidence.

TABLE 4 CONCLUSION

CONCERN	EVIDENCE
Heathrow’s charges are unreasonable	<ul style="list-style-type: none"> • Heathrow’s charges are high. • However, they are regulated by the CAA and designed to be cost-reflective. The CAA has published extensive documentation underlying its decision for 2022. This regulation limits Heathrow’s profitability and prevents it from exploiting any position of market power that may exist.
The higher charges will result in higher ticket prices	<ul style="list-style-type: none"> • An increase in airport charges would only be passed through to passengers in the form of higher ticket prices if airlines reduce capacity. However, given the 70/30 rule, we are actually seeing the opposite happen. • Airlines have increased their capacity to above the 70% threshold (despite having low load factors in 2021) in order to hold onto their slots. • Prior to the pandemic, there was a congestion premium at Heathrow worth around £2 billion a year in terms of additional revenue to airlines. This explains why – prior to the pandemic – airlines paid tens of millions of pounds to buy slots at Heathrow. • Airlines would be prepared to operate at a loss in the short term in order to continue earning a premium in future when demand returns.
The higher charges will negatively impact on route viability	<ul style="list-style-type: none"> • We see no evidence of the network at Heathrow being negatively impacted. • The network in Q1 2022 is broadly the same as in Q1 2019 but with lower frequency.

ANNEX A - DETAILS OF THE ECONOMETRIC ANALYSIS

In this section, we describe the econometric analysis used to estimate the premium on ticket prices at Heathrow. The aim of this analysis is to estimate the impact of slot scarcity on ticket prices at Heathrow in recent years (2019-2021), using the same methodology used in our previous analysis of the congestion premium (which covered the years 2011-2018).

This updated analysis includes the pandemic years of 2020 and 2021, which clearly can be considered very unusual years for the sector. The ticket pricing at Heathrow and at other airports during the pandemic period may deviate substantially from the years before and years afterward. Therefore, the results from 2020 and 2021 should be interpreted with caution. We suggest that the previous analysis of 2011-2018 data⁶⁹ is the most informative about 'business-as-usual' conditions at Heathrow and therefore about trends post-recovery.

As discussed in Section 5, many factors impact on ticket prices, including distance, mix of ticket classes, fuel prices, and so on. The econometric analysis aims to compare ticket prices at Heathrow with those at comparator airports in Europe, statistically controlling for the effects of other drivers of ticket prices, in order to isolate the impact of slot scarcity at Heathrow.

The rest of this annex is structured as follows:

- Data used in the econometric analysis
- Econometric model specifications
- Results
- Coefficient tables
- Comparison to previous estimates

A.1 - DATA USED IN THE ECONOMETRIC ANALYSIS

The data sources used in the analysis are summarised below.

TABLE 5 DATA SOURCES

DATA	DESCRIPTION	SOURCE
Average ticket prices	The outcome of interest. We have chosen to model prices in log form, to allow for a clear interpretation of coefficients as proportional effects, and to better approximate the relationships between key variables of interest and prices.	IATA Passenger Intelligence Services (PaxIS)
Distance	Great circle distance is measured in km. There are costs that vary with the distance of the flight (e.g. crew costs, fuel consumption)	Public data on airport location
Frequency (own)	Expressed as the average number of departures per day in each year and included in regressions in log form. Own frequency refers to the number of departures from the airport to the particular destination in question. This variable is intended to capture the supply of seats	OAG Schedules Analyser

⁶⁹ <https://www.caa.co.uk/media/p4jftpe4/estimating-the-congestion-premium-at-heathrow.pdf>

DATA	DESCRIPTION	SOURCE
	on a given route, and the established relationship between demand and frequency.	
Frequency (other)	Expressed as the average number of departures per day in each year and included in regressions in log form. "Other" frequency measures the number of flights to that particular destination from all other airports in the sample, reflecting its desirability and popularity as a destination beyond what is indicated by the own-route frequency. Since this variable is included log form, it implies that all destinations must be served by at least one other airport in the sample. In other words it requires that a route is an overlapping destination with another origin.	OAG Schedules Analyser
Transfer share	Transfer share measures the proportion of passengers on a given route who are transfer passengers. This is intended to proxy for demand on a route beyond the number of passengers travelling directly.	PaxIS
LCC share	LCC share refers to the proportion of seats on a route flown by Low Cost Carriers (LCCs). While the ticket prices paid by LCC passengers themselves do not appear in the data due to limitations of the source dataset, the presence of LCCs on a route gives mainline customers the option of a lower price, so would be expected to drive down prices.	OAG Schedules Analyser
Business class share	Business class share measures the proportion of passengers on a flight who are estimated to have flown business class or above. This is because the mix of passenger classes is assumed to influence overall ticket prices, and potentially proxy for overall demand. Note that, for the purposes of this analysis, premium economy has been treated as business class.	OAG Traffic Analyser
European jet fuel price	European jet fuel price is a common measure of fuel prices (in logs) across all airports in a given year, and is a key source of costs for airlines. However, as we are using annual models, the annual jet fuel price is dropped from the regressions as it is captured in the intercept of the model.	N/A
Average seats (plane size)	Average seats measures the average number of seats per departure on a given route, as a measure of the supply available to be filled, although this is itself arguably a potential response to the congestion premium.	OAG Schedules Analyser
Airport competition	Airport competition is a measure of the proportion of seats between two cities that is served by the airport-to-airport pair. For example, it reflects the proportion of seats between London and New York covered by the Heathrow-JFK route.	Frontier analysis of OAG Schedules Analyser
Route competition	Route-level competition measures the extent to which airlines on a route dominate or compete with other airlines. There are two variables we have used: firstly, we include a dummy for routes served by only a single carrier; secondly, we include a Herfindahl-	Frontier analysis of OAG Schedules Analyser

DATA	DESCRIPTION	SOURCE
	Hirschman Index (HHI) score. Together, these two variables imply an overall relationship between carrier market shares at a route level and fares, while allowing for the single carrier market to be a special case.	
Skytrax rank (airport quality)	Skytrax rank is a ranking of airport service quality across the world from 1 to 100. The lower the score, the better the airport's quality in a given year and vice versa. Because this analysis has annual models for 2019-2020 (see explanation below) the sample size is significantly reduced compared to the previous analysis that was pooled across 2011-2018. As a result, including the Skytrax rank as a continuous predictor introduces instability into the regression results. ⁷⁰ To avoid the instability, the Skytrax ranking in the annual models is dichotomised (airport rank greater than or equal to 50 vs. rank below 50).	Skytrax

Source: Frontier Economics

A.2 - ECONOMETRIC MODEL SPECIFICATIONS

This approach estimates the airfare premium at Heathrow by using a Heathrow dummy variable. This assumes that all statistical differences between Heathrow and comparable airports, after controlling for other drivers of fares in the model, are attributable to capacity constraints at Heathrow (a residual approach). We would note that in our previous work for Heathrow we also estimated the premium using separate approaches – e.g. analysis of slot transfer prices, which supported the findings of our econometrics analysis.

A.2.1 - OBSERVATIONAL UNIT

The observational unit in the models was average ticket prices on individual point-to-point route, by year. The analysis included 2019-2021, (the previous analysis went up to 2018, and data on 2022 was not yet available). The set of point-to-point routes consisted of all routes departing from Heathrow or departing from a set of comparator European airports.

A.2.2 - CONSTRUCTION OF THE SAMPLE

The sample was designed to compare Heathrow with airports that are similar in terms of the key characteristics of size and geographic region. The comparator airports consisted of the 10 largest airports in developed countries in Europe⁷¹ by 2019 passenger volume, and also airports serving the London region. These are summarised below.

⁷⁰ Including the Skytrax rank as a continuous predictor in the annual models has a type of small sample size problem. Each airport has one annual Skytrax rank, and there are 14 airports in the sample. Therefore this problem is equivalent to attempting to fit a regression line through 14 data points. As the sample size is too small, there is a large amount of noise in the estimated relationship between rank and airfares, and the results are subject to a high degree of noise.

⁷¹ https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2022_ANNEX.pdf

TABLE 6 AIRPORT SAMPLE: 10 LARGEST AIRPORTS IN DEVELOPED COUNTRIES IN EUROPE

CODE	AIRPORT	2019 PASSENGERS
LHR	Heathrow Airport	80m
CDG	Charles de Gaulle Airport	76m
AMS	Amsterdam Airport Schiphol	72m
FRA	Frankfurt Airport	71m
MAD	Madrid Barajas Airport	62m
BCN	Barcelona-El Prat Airport	53m
MUC	Munich Airport	48m
LGW	London Gatwick Airport	47m
FCO	Aeroporto di Roma-Fiumicino	44m
DUB	Dublin Airport	33m

Source: <https://www.panynj.gov/content/dam/airports/statistics/statistics-general-info/annual-atr/ATR2019.pdf>

TABLE 7 AIRPORT SAMPLE: OTHER AIRPORTS SERVING THE LONDON REGION

CODE	AIRPORT	2019 PASSENGERS
STN	Stansted Airport	28m
LTN	Luton Airport	18m
LCY	London City Airport	5m
SEN	Southend Airport	2m

Source: PaxIS

We have been conservative and have assumed that the premium only impacts on point-to-point passengers. In other words we assume there is no premium for beyond or transfer passengers. The rationale is that transfer passengers may have multiple options for how they connect to their final destination. A passenger flying from Dublin to New York may be able to connect via Heathrow or a number of other hubs. Because passengers have multiple options, airlines offering a connection via Heathrow may find that any increase in their price will result in passengers choosing to fly via other hubs instead. This competition (and relatively limited differentiation) ensures that airlines may not be able to increase their prices even if there is excess demand at Heathrow. By extension, we conservatively assume that there is no premium for beyond passengers because they may also have multiple options to connect to their final destination, both between many different airlines at Heathrow, as well as possible options at other London airports too. However, for O/D passengers wishing to fly on direct routes, Heathrow may be the only option in London, and passengers may have no direct outside options. This is an illustration of the differentiation point made in our introduction. This means that Heathrow is less differentiated for transfer and beyond passengers than for point-to-point passengers. We recognise that the picture may be mixed from route to route. A transfer passenger wishing to fly to particular end destination may only have one option if it is only connected to

one hub, or if only one hub has a direct connection to the end destination – although two-stop connections could also be an option. Similarly, some direct connections at Heathrow may also appear at other airports in London, which may limit the ability of airlines at Heathrow to set higher prices – although as noted Heathrow still remains differentiated. By assuming that the premium only applies to point-to-point passengers – just over half of the total passengers at Heathrow – we believe that our approach is conservative. We nonetheless control for the proportion of passengers on a route who are transfer passengers in many of our models.

A.2.3 - STRATIFICATION BY SHORT- AND LONG-HAUL, AND YEAR

We have modelled short haul and long haul routes separately. This is to reflect the different underlying economics of operation and the potential for different trends in the price premium. We have used the cut-off of 2,000 nautical miles (roughly 3,700 km) that is commonly used in the industry, and that we used in our previous analysis.

In our previous analysis, we pooled together multiple years of data. In this analysis, we have estimated each year separately, from 2019 to 2021 (2022 data is not yet available). The reason for this approach is to appropriately account for the effects of the COVID-19 pandemic, the disruption from which may have caused material year-on-year differences in the relationship between ticket prices and different cost drivers. The disadvantage of this approach is a loss in statistical power due to the smaller sample size in each year. Nevertheless, we find that the regression estimates across years were stable, suggesting that the modelling approach has an appropriate level of precision for this application.

A.2.4 - MODEL SPECIFICATIONS

Our core models are of the form:

$$\ln(AvgFare_{r,y}) = \beta_0 + \beta_1 I_{Heathrow} + \beta_2 Dist_r + \dots + u_{r,y}$$

Where r indicates the route and y indicates the year of the observation. $AvgFare_{r,y}$ is the average fare, $\widehat{\beta}_1$ is the premium estimate of interest, and $I_{Heathrow}$ is an indicator for whether the route is a Heathrow route, $Dist_r$ is the route distance, and $u_{r,y}$ is the error term. Each model is estimated by OLS with robust standard errors. Each model has been run twice to ensure that outliers are excluded from the final estimation, defined as observations with residuals more than 3 standard deviations from zero. This means that the number of observations will vary slightly between models.

No single econometric approach is perfect in the sense that it is not feasible to exactly predict ticket prices. For this reason, we estimate a range of models, that vary in terms of which drivers of ticket prices are included.

The results include a set of models, from a narrow model (few predictors) to a wide model (all predictors). This is to ensure that the results are not unreasonably sensitive to the particular choice of predictors.

TABLE 8 STRUCTURE AND PRESENTATION OF CORE MODELS

VARIABLES	NARROW	1	2	3	WIDE
Distance	X	X	X	X	X
Heathrow dummy	X	X	X	X	X
Frequency (own)		X	X	X	X
Frequency (other)		X	X	X	X
Transfer share		X	X	X	X
LCC share*			X	X	X
Business class share			X	X	X
Avg. seats					X
Airport competition					X
Route competition					X
Skytrax rank					X

Source: Frontier analysis

Note: LCC share is included in short-haul models only

A.2.1 - INTERPRETATION OF PREMIUM ESTIMATES

The fares listed exclude taxes. The exclusion of taxes mean that our estimate of the difference in prices paid by passengers is an underestimate, as Air Passenger Duty (APD) is higher in the UK than equivalent taxes in the rest of Europe. It does not, however, affect our estimate of the congestion premium, as we are estimating the difference in prices relative to a world without capacity constraints, not relative to a world of equal taxes. The data provided is for one-way prices, and we model our estimates on that basis (through the departures from sample airports).

The ticket price data included in the regression analysis includes airport charges. As highlighted earlier, in Section 2, airport charges at Heathrow are generally higher than those at other airports and are a legitimate reason that can partly explain why ticket prices are higher at Heathrow than at other airports (albeit clearly there is also a congestion premium on top). Ideally, we would include airport charges in the model itself as an explanatory variable to control for this difference in order to isolate the pure congestion premium. However, airport charges can vary significantly from route to route even at the same airport and depend heavily on airline operating assumptions – e.g. aircraft model, turnaround time, load factors, use of airbridges, etc.. Therefore, we follow a two-step approach:

- First, we estimate the premium inclusive of the higher airport charges at Heathrow. In other words, this estimate is essentially the congestion premium plus the higher airport charges at Heathrow; and
- Second, to control for this, as an ‘off model’ adjustment, we then express the Heathrow premium estimated above in absolute terms and then subtract the average difference in airport charges identified earlier in Section 2 (i.e. £20 for short haul and £30 for long haul). This then produces our final estimates of the premium.

A.3 - SUMMARY OF REGRESSION RESULTS

The tables below show a summary of coefficients for long haul and short haul flights respectively, for the ‘wide’ specification of the model, as described in Table 8. (More detailed regression outputs are included in the following subsection.) As discussed above, note that in the first instance the estimates below are not adjusted for differences in airport charges. (We subtract the difference in airport charges below.) The estimated premium across the period for long haul routes is between 20%-28%, and the estimated premium across the period for short haul routes is between 12%-18%. Each Heathrow dummy coefficient in every year, is statistically significant (at above the 5% level for long-haul in 2021, and at above the 1% level for both short haul and long haul routes in all other years).

TABLE 9 SUMMARY OF LONG HAUL COEFFICIENTS BY YEAR

	2019	2020	2021
Distance (000 KM)	0.00005***	0.00007***	0.00006***
Frequency (own)	0.23318***	0.15249**	0.31827***
Frequency (other)	0.02748	0.05807***	0.03572
Transfer share	0.38597***	-0.12667	0.0169
Business class share	0.53903***	0.38931	0.05557
LHR indicator	0.21994***	0.24245***	0.18618**
Slot scarcity premium (not adjusted for airport charges)	25%	27%	20%

Source: Frontier analysis

Note: All models estimate average log fares for routes using OLS, robust standard errors are reported in brackets.

Each model is estimated with outliers (residual > 3sd) excluded

* denotes statistical significance at the 10% level; **denotes statistical significance at the 5% level; *** denotes statistical significance at the 1% level.

The estimated slot scarcity premium does not account for airport charges.

TABLE 10 SUMMARY OF SHORT HAUL COEFFICIENTS BY YEAR

	2019	2020	2021
Distance (000 KM)	0.00030***	0.00030***	0.00032***
Frequency (own)	0.02602	0.01888	0.01278
Frequency (other)	0.00882	-0.00008	-0.01205*
Transfer share	0.56021***	0.58389***	0.58640***
LCC share	-0.20963***	-0.23947***	-0.18217***
Business class share	-0.58740***	-0.44363***	-0.18305*
LHR indicator	0.16240***	0.11477***	0.14792***
Slot scarcity premium (not adjusted for airport charges)	18%	12%	16%

Source: Frontier analysis

Note: All models estimate average log fares for routes using OLS, robust standard errors are reported in brackets.

Each model is estimated with outliers (residual > 3sd) excluded

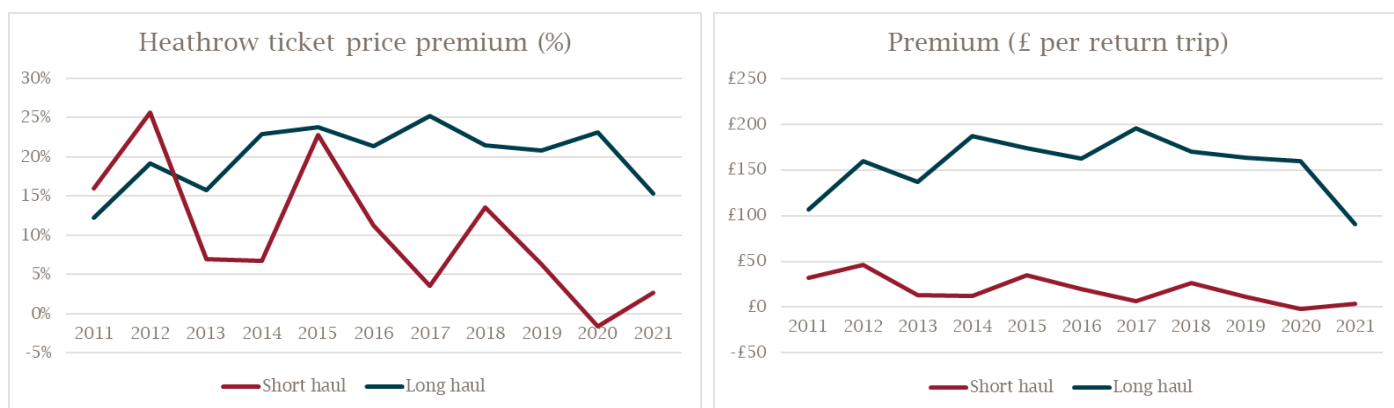
* denotes statistical significance at the 10% level; **denotes statistical significance at the 5% level; *** denotes statistical significance at the 1% level.

The estimated slot scarcity premium does not account for airport charges.

In the charts below we then take the premium figures estimated above and subtract the difference between Heathrow’s airport charges and the sample average airport charges, for both short haul and long haul separately. (As set out in Section 2, this equates to £30 per passenger charge for long haul routes and a £20 per passenger charge for short haul routes.)

After controlling for airport charges, there is still evidence of a premium for long haul routes, of around 15%-23% for 2020 and 2021. In other words, after controlling for other factors, ticket prices at Heathrow were still 15%-23% higher than those at the other airports included in the sample. This equates to around £90-£160 for a passenger making a return trip. However for short haul routes, there is no strong evidence of a premium after considering airport charges.

FIGURE 37 EVIDENCE OF A PREMIUM AT HEATHROW



Source : Frontier analysis

Note: Figures are net of airport charges

However, as noted earlier, the results for 2020 and 2021 need to be interpreted with caution. It is obviously worth stressing that these were extremely unusual years for the sector, with demand at Heathrow falling from 80 million passengers in 2019 to 20 million in 2020 and 2021, and with sudden and unpredictable changes to restrictions. Therefore, to some extent, we need to be cautious about analysing ticket prices during this time, and the results may not tell us much about what the premium will look like going forward.

Our previous analysis has found that - prior to the pandemic - there was a significant premium for both short haul and long haul, with airlines earning around £2 billion per annum in additional revenue.

Airlines have increased their capacity in 2022 - despite the higher airport charges at Heathrow (as well as much larger increases in fuel costs and labour costs), and despite significant uncertainty over future demand and profitability - in order to ensure that they comply with the 70/30 slot allocation rule. This suggests that they anticipate demand (and the premium) will return in future.

We would only expect to see cost passthrough if airlines reduced their capacity, which would increase the scarcity of seats and push up prices to the point where the higher cost would be passed through to passengers. However, given that airlines have actually increased their capacity (to keep hold of their slots), there will be no cost passthrough.

When the premium fully re-establishes itself, we would also not expect to see any cost passthrough as prices would already be elevated above cost at the level needed to price the excess demand out of the market, which would be unchanged regardless of changes to input costs.

A.4 - COEFFICIENT TABLES

This section contains the full tables of estimated coefficients from all models. Each model estimates log fares for all short or long haul routes included in our sample, and for each year, with an increasing number of control variables.

The coefficients associated with the Heathrow dummies have been used to calculate the percentage slot scarcity premium. This is applied to the number of return journeys taken from Heathrow, and the average ticket price of each journey, to give the estimate of the total congestion premium.

The results for the slot scarcity premium (before accounting for airport charges) show that:

- For long haul, the Heathrow dummy is positive and statistically significant (at least at the 10% significance level) across all models for all years. The slot scarcity premium in percentage terms is between 20%-27% across the years considered. On a return flight basis, this means that each year, the slot scarcity premium cost passengers £138m-£844m in 2021.
- For short haul, the Heathrow dummy is positive and statistically significant (at the 1% significance level) across all models for all years. The slot scarcity premium in percentage terms is between 12%-18% across the years considered. On a return flight basis, this means that each year, the slot scarcity premium costs passengers £34m-£215m in 2021.

The impact of the control variables is summarised below:

- The coefficient on distance is positive and statistically significant for all models and all years, and does not vary much across models for both short haul and long haul. This result matches expectations as distance is a key determinant of flight costs.
- The results show mixed effects for both frequency variables. In some cases the results are not statistically different from zero, whilst in other cases the results are either positive or negative and statistically different from zero. For example, for 2021, the own frequency coefficient is positive and statistically significant for long haul, but not statistically different from zero for short haul. However the coefficient on the 'other' frequency variable, intended to capture desirability of a given route, is negative and statistically significant for short haul and positive for long haul in all but the wide model.
- The transfer share coefficients for short haul are positive and statistically significant across all models for all years. The transfer share coefficients for long haul are only significant for 2019, and not for 2020 and 2021. This would suggest the transfer share is not a good proxy for demand during the pandemic years.
- The LCC share coefficients for short haul are negative and statistically significant for all years, as expected. The LCC variable for long haul has been dropped from the regressions, likely because relatively few long haul routes operate with a LCC and there was therefore insufficient variation in this variable.
- The coefficients for the business class share variable indicate that the proportion of business class passengers on a given route impact short haul and long haul fares differently. For short haul, the business class share coefficients are negative for all three years (and are statistically significant for 2019 and 2020), whilst for long haul, the coefficients are positive for all three years (and statistically

significant for 2019 only). The effect of business class traffic on pricing at Heathrow versus at other airports during the pandemic years is difficult to interpret. For 2019, the negative coefficient on share of business traffic for short-haul may indicate relatively strong competition for point-to-point business traffic from other London airports for short-haul flights.

- The coefficient on average seats, a proxy for aircraft size, is positive and statistically significant for all models and all years apart from the wide model for long haul for 2021.
- The coefficients on the competition variables, the single carrier indicator and route HHI, are mixed. The coefficient for single carrier indicator is positive and statistically significant for both short and long haul for all years. However, the coefficient of route-level HHI is not significant for long haul, and negative and significant for short haul. This suggests that less airline competition has an upward pressure on fares, but less airline competition either has no impact on prices or reduces fares.
- The coefficient on airport ranking is statistically significant for long haul for 2020 and 2021, but not for 2019 or any year for short haul.

TABLE 11 COEFFICIENT TABLE – LONG HAUL 2021

	Narrow	1	2	3	WIDE
Heathrow indicator	0.13375**	0.18846***	0.18649**	0.13936*	0.18618**
	{0.06404}	{0.07069}	{0.07192}	{0.07779}	{0.07587}
Distance (000s KM)	0.00004**	0.00005***	0.00005***	0.00005***	0.00006***
	{0.00002}	{0.00002}	{0.00002}	{0.00002}	{0.00002}
Frequency (own)		0.08011*	0.07427	0.13876	0.31827***
		{0.04545}	{0.04578}	{0.08469}	{0.08507}
Frequency (other)		0.06669***	0.06726***	0.06065**	0.03572
		{0.02363}	{0.02381}	{0.02429}	{0.02328}
Transfer Share		0.1116	0.10738	-0.01311	0.0169
		{0.12519}	{0.12684}	{0.14386}	{0.14784}
Business class share			0.08188	0.0317	0.05557
			{0.27228}	{0.28058}	{0.25816}
Average seats				0.22674**	0.10014
				{0.09752}	{0.08627}
Airport competition				0	-0.00000**
				{0.00000}	{0.00000}
HHI (route level)					0.04516
					{0.09178}
Single carrier indicator					0.63138***
					{0.14269}
Airport ranking					0.36994*
					{0.20580}
Constant	✓	✓	✓	✓	✓
Observations	183	182	182	182	182
Slot scarcity premium (£m)	£102.33	£140.40	£139.07	£106.33	£138.86
Slot scarcity premium (%)	14%	21%	21%	15%	20%
Adj. R-squared	0.03516	0.14122	0.13692	0.15435	0.26817
RMSE	0.38507	0.35951	0.36041	0.35675	0.33187

Source: Frontier analysis

Note: All models estimate average log fares for routes for 2021 using OLS, robust standard errors are reported in brackets.

Each model is estimated with outliers (residual > 3sd) excluded

* denotes statistical significance at the 10% level; **denotes statistical significance at the 5% level; *** denotes statistical significance at the 1% level.
The estimated slot scarcity premium does not account for airport charges.

TABLE 12 COEFFICIENT TABLE – SHORT HAUL 2021

	Narrow	1	2	3	WIDE
Heathrow indicator	0.24580*** {0.02823}	0.27265*** {0.02807}	0.17607*** {0.03171}	0.15737*** {0.03136}	0.14792*** {0.03331}
Distance (000s KM)	0.00027*** {0.00001}	0.00033*** {0.00001}	0.00031*** {0.00001}	0.00030*** {0.00001}	0.00032*** {0.00001}
Frequency (own)		-0.00142 {0.01075}	-0.02000* {0.01095}	0.00404 {0.01685}	0.01278 {0.01731}
Frequency (other)		-0.01006 {0.00640}	-0.01164* {0.00628}	-0.01031* {0.00621}	-0.01205* {0.00651}
Transfer Share		0.86589*** {0.04490}	0.66208*** {0.05843}	0.59597*** {0.06296}	0.58640*** {0.06343}
LCC Share			-0.19958*** {0.03011}	-0.17912*** {0.02999}	-0.18217*** {0.03146}
Business class share			-0.15921 {0.10551}	-0.14001 {0.10971}	-0.18305* {0.10513}
Average seats				0.06191*** {0.01861}	0.06182*** {0.02048}
Airport competition				-0.00000* {0.00000}	-0.00000* {0.00000}
HHI (route level)					-0.04076* {0.02286}
Single carrier indicator					0.12012*** {0.04407}
Airport ranking					-0.05774 {0.05263}
Constant	✓	✓	✓	✓	✓
Observations	1084	1083	1082	1080	1082
Slot scarcity premium (£m)	£73.11	£80.06	£54.16	£48.85	£46.13
Slot scarcity premium (%)	28%	31%	19%	17%	16%
Adj. R-squared	0.34385	0.55028	0.57288	0.5768	0.57942
RMSE	0.2933	0.24183	0.23491	0.23316	0.23311

Source: Frontier analysis

Note: All models estimate average log fares for routes for 2021 using OLS, robust standard errors are reported in brackets. The estimated slot scarcity premium does not account for airport charges.

Each model is estimated with outliers (residual > 3sd) excluded

* denotes statistical significance at the 10% level; **denotes statistical significance at the 5% level; *** denotes statistical significance at the 1% level.

TABLE 13 COEFFICIENT TABLE - LONG HAUL 2020

	Narrow	1	2	3	WIDE
Heathrow dummy	0.29907*** {0.06166}	0.30141*** {0.06501}	0.28436*** {0.06552}	0.24664*** {0.06787}	0.24245*** {0.06826}
Distance (000s KM)	0.00007*** {0.00001}	0.00008*** {0.00002}	0.00007*** {0.00002}	0.00006*** {0.00002}	0.00007*** {0.00001}
Frequency (own)		0.07773* {0.03950}	0.06504* {0.03879}	0.06805 {0.06972}	0.15249** {0.07399}
Frequency (other)		0.05535*** {0.01746}	0.05424*** {0.01778}	0.06163*** {0.01971}	0.05807*** {0.01997}
Transfer Share		0.09657 {0.13205}	0.02206 {0.14399}	-0.08953 {0.14982}	-0.12667 {0.14539}
Business class share			0.386 {0.24329}	0.37055 {0.24915}	0.38931 {0.23757}
Average seats				0.20538*** {0.07437}	0.19475** {0.07547}
Airport competition				0 {0.00000}	0 {0.00000}
HHI (route level)					0.02784 {0.08029}
Single carrier dummy					0.25332* {0.13711}
Airport ranking					0.39895* {0.22440}
Constant	✓	✓	✓	✓	✓
Observations	205	205	205	205	205
Slot scarcity premium (£m)	£311.34	£313.42	£298.10	£263.26	£259.31
Slot scarcity premium (%)	35%	35%	33%	28%	27%
Adj. R-squared	0.17049	0.24265	0.25037	0.26784	0.27993
RMSE	0.37335	0.35674	0.35492	0.35076	0.34785

Source: Frontier analysis

Note: All models estimate average log fares for routes for 2020 using OLS, robust standard errors are reported in brackets. The estimated slot scarcity premium does not account for airport charges.

Each model is estimated with outliers (residual > 3sd) excluded

* denotes statistical significance at the 10% level; **denotes statistical significance at the 5% level; *** denotes statistical significance at the 1% level.

TABLE 14 COEFFICIENT TABLE – SHORT HAUL 2020

	Narrow	1	2	3	WIDE
Heathrow indicator	0.28299*** {0.03161}	0.28592*** {0.02817}	0.17281*** {0.03387}	0.15582*** {0.03166}	0.11477*** {0.03386}
Distance (000s KM)	0.00025*** {0.00001}	0.00032*** {0.00001}	0.00029*** {0.00001}	0.00029*** {0.00001}	0.00030*** {0.00001}
Frequency (own)		-0.00523 {0.01170}	-0.01995* {0.01180}	0.00009 {0.01943}	0.01888 {0.01956}
Frequency (other)		-0.00141 {0.00653}	-0.00251 {0.00663}	-0.00501 {0.00625}	-0.00008 {0.00630}
Transfer Share		1.00695*** {0.05078}	0.75745*** {0.07385}	0.63841*** {0.07856}	0.58389*** {0.07999}
LCC Share			-0.25883*** {0.03674}	-0.20499*** {0.03629}	-0.23947*** {0.03701}
Business class share			-0.37798*** {0.11646}	-0.33802*** {0.11638}	-0.44363*** {0.11548}
Average seats				0.12886*** {0.01898}	0.14265*** {0.01899}
Airport competition				0 {0.00000}	0 {0.00000}
HHI (route level)					-0.06666*** {0.02240}
Single carrier indicator					0.26661*** {0.04517}
Airport ranking					-0.03774 {0.05945}
Constant	✓	✓	✓	✓	✓
Observations	1045	1039	1044	1044	1043
Slot scarcity premium (£m)	£79.02	£80.24	£51.21	£46.14	£34.67
Slot scarcity premium (%)	33%	33%	19%	17%	12%
Adj. R-squared	0.31287	0.54948	0.55452	0.57253	0.59257
RMSE	0.29288	0.23648	0.23617	0.23144	0.22575

Source: Frontier analysis

Note: All models estimate average log fares for routes for 2020 using OLS, robust standard errors are reported in brackets.

Each model is estimated with outliers (residual > 3sd) excluded

* denotes statistical significance at the 10% level; **denotes statistical significance at the 5% level; *** denotes statistical significance at the 1% level.

The estimated slot scarcity premium does not account for airport charges.

TABLE 15 COEFFICIENT TABLE – LONG HAUL 2019

	Narrow	1	2	3	WIDE
Heathrow indicator	0.28620*** {0.05230}	0.32847*** {0.04946}	0.29645*** {0.04902}	0.26437*** {0.05135}	0.21994*** {0.05203}
Distance (000s KM)	0.00006*** {0.00001}	0.00005*** {0.00001}	0.00004*** {0.00001}	0.00004*** {0.00001}	0.00005*** {0.00001}
Frequency (own)		0.09766*** {0.02600}	0.06952*** {0.02639}	0.10919** {0.04350}	0.23318*** {0.05271}
Frequency (other)		0.03809** {0.01530}	0.03420** {0.01606}	0.03895** {0.01677}	0.02748 {0.01684}
Transfer Share		0.65806*** {0.07799}	0.54894*** {0.07934}	0.44294*** {0.08664}	0.38597*** {0.08836}
Business class share			0.66270*** {0.15424}	0.64212*** {0.15244}	0.53903*** {0.15021}
Average seats				0.12705*** {0.04627}	0.13325*** {0.04560}
Airport competition				0 {0.00000}	-0.00000** {0.00000}
HHI (route level)					-0.01228 {0.07395}
Single carrier dummy					0.38991** {0.15579}
Airport ranking					0.21774 {0.17992}
Constant	✓	✓	✓	✓	✓
Observations	369	368	369	370	370
Slot scarcity premium (£m)	£1,064.93	£1,197.94	£1,097.70	£994.00	£844.77
Slot scarcity premium (%)	33%	39%	35%	30%	25%
Adj. R-squared	0.12452	0.38348	0.40587	0.40795	0.43421
RMSE	0.38523	0.32448	0.31986	0.32094	0.31374

Source: Frontier analysis

Note: All models estimate average log fares for routes for 2019 using OLS, robust standard errors are reported in brackets.

Each model is estimated with outliers (residual > 3sd) excluded

* denotes statistical significance at the 10% level; **denotes statistical significance at the 5% level; *** denotes statistical significance at the 1% level.
The estimated slot scarcity premium does not account for airport charges.

TABLE 16 COEFFICIENT TABLE – SHORT HAUL 2019

	Narrow	1	2	3	WIDE
Heathrow indicator	0.33600*** {0.02960}	0.29681*** {0.03019}	0.22326*** {0.03355}	0.18843*** {0.03182}	0.16240*** {0.03232}
Distance (000s KM)	0.00022*** {0.00001}	0.00030*** {0.00001}	0.00029*** {0.00001}	0.00028*** {0.00001}	0.00030*** {0.00001}
Frequency (own)		0.00047 {0.01007}	-0.01072 {0.01000}	0.01999 {0.01591}	0.02602 {0.01595}
Frequency (other)		0.01326** {0.00671}	0.01502** {0.00649}	0.00986 {0.00619}	0.00882 {0.00612}
Transfer Share		0.88429*** {0.03914}	0.75664*** {0.05425}	0.59511*** {0.05464}	0.56021*** {0.05430}
LCC Share			-0.23195*** {0.03100}	-0.18944*** {0.02952}	-0.20963*** {0.02933}
Business class share			-0.45765*** {0.10733}	-0.53511*** {0.09888}	-0.58740*** {0.09945}
Average seats				0.17776*** {0.01692}	0.18676*** {0.01763}
Airport competition				-0.00000** {0.00000}	0 {0.00000}
HHI (route level)					-0.09231*** {0.02352}
Single carrier indicator					0.26393*** {0.04722}
Airport ranking					0.02041 {0.04057}
Constant	✓	✓	✓	✓	✓
Observations	1347	1347	1345	1344	1344
Slot scarcity premium (£m)	£409.78	£368.77	£287.32	£246.61	£215.61
Slot scarcity premium (%)	40%	35%	25%	21%	18%
Adj. R-squared	0.25306	0.49165	0.51769	0.55701	0.56693
RMSE	0.31653	0.26209	0.25447	0.2435	0.24052

Source: Frontier analysis

Note: All models estimate average log fares for routes for 2019 using OLS, robust standard errors are reported in brackets.

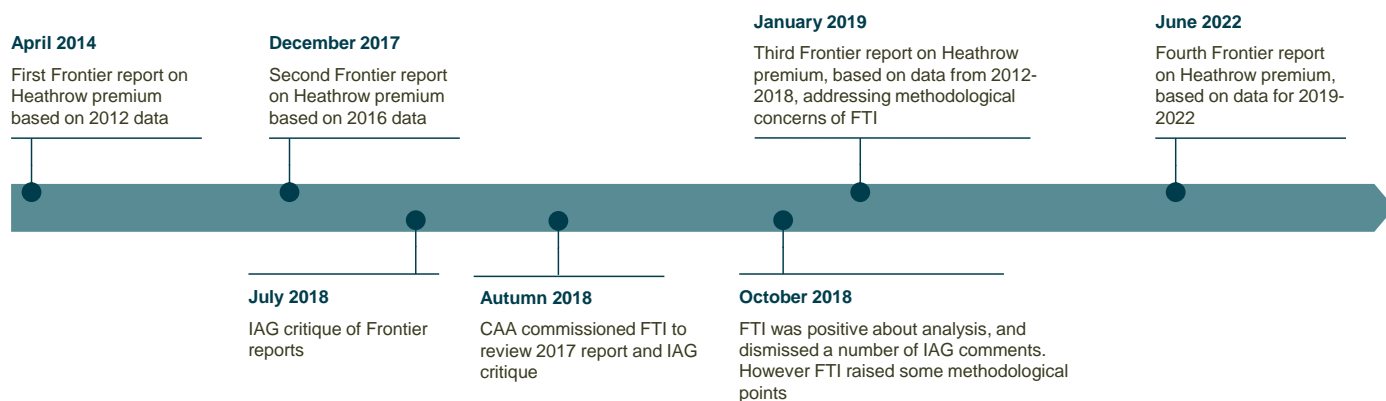
Each model is estimated with outliers (residual > 3sd) excluded

* denotes statistical significance at the 10% level; **denotes statistical significance at the 5% level; *** denotes statistical significance at the 1% level.
The estimated slot scarcity premium does not account for airport charges.

A.5 - COMPARISON TO PREVIOUS ESTIMATES

This report is our fourth to estimate the ticket price premium at Heathrow. The timeline below sets out the Frontier reports and the review and critique reports produced in response.

FIGURE 38



The second report, published in December 2017, contained our main results. The third Frontier report, published in January 2019, addressed the methodological concerns raised by FTI in their review of the second Frontier report, and demonstrated that these concerns did not impact the results. The presence of a Heathrow premium was acknowledged by the CAA in 2019, “*we consider that it is likely that some airlines are earning scarcity rents at Heathrow airport*”.⁷² The purpose of the econometric analysis for this report is therefore to update the core models based on 2019-2022 data.

Table 17 shows how the most recent estimates of the premium compare to the previous report. After accounting for airport charges, there remains a slot scarcity premium for long haul for the period 2019-2022. Unlike 2012-2018, there is no strong evidence of a premium for short haul for 2019-2022. However, the results for 2020 and 2021 are impacted by the pandemic and are therefore unlikely to reflect future market conditions. Ultimately, the fact that airlines have retained their slots indicates that airlines expect Heathrow slots to provide a premium in the future.

TABLE 17 COMPARISON TO PREVIOUS CONGESTION PREMIUM ESTIMATES

	Average premium 2011-2018	Average premium 2019-2021 (net of airport charges)
Long haul	14%	20%
Short haul	23%	2.7%

Source: Frontier analysis

Note: The congestion premium estimates refer to the ‘max’ model (i.e. with all independent variables included).

⁷² <https://publicapps.caa.co.uk/docs/33/CAP1871%20Early%20expansion%20costs%20condoc%20v1.6.pdf>



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