Research in Transportation Economics, Volume 79, March 2020, Article number 100760
DOI: 10.1016/j.retrec.2019.100760

Airport competition within the Scottish Lowlands region

Romano Pagliari, Anne Graham

Abstract

The aim of this paper is to undertake an assessment of airport competition within the Scottish Lowlands region, which has experienced significant variations in economic development, and to examine whether competitive forces have been strengthening or weakening in recent years. This region covers the airports of Edinburgh, Glasgow and Prestwick in the last twelve years they have all experienced changes in ownership. BAA which had, for many years, operated both Edinburgh and Glasgow airports, sold the former to GIP in 2012 whilst in 2013 the Scottish Government purchased the privately-owned Prestwick. During this period there were also significant changes in airline network strategies. In order to assess the competitive pressures facing these airports, three key areas are considered, namely: aeronautical charging policy, the service quality provided and traffic development. The analysis shows that since ownership separation, competition has intensified between Edinburgh and Glasgow, whilst Prestwick airport, which benefitted from Ryanair expansion in the 1990s, is now a significantly diminished competitive proposition in the Scottish Lowland market. This has implications not only for airport policy and economic regulation but also for broader economic well-being in this region.

Key words

Scottish airports, airport competition, aeronautical charges, route development

JEL classification

L43 R41 R49

1. Introduction

The Scottish Lowlands region in the UK with a total population of around five million citizens is served by three main airports: Edinburgh, Glasgow and Prestwick. Edinburgh is the largest of the three, serving 14.3 million passengers in 2018, compared to 9.7 million at Glasgow and only 0.7 million at Prestwick. Edinburgh and Glasgow airports are separated by a distance of 77 km, connected by the M8 motorway which links their respective metropolitan areas, with populations of around 450,000 and 600,000 respectively. Prestwick also serves the Glasgow metropolitan region. However, Glasgow airport is much closer to the main population catchment area as it is located in Paisley which is only 15 km from the City Centre. In contrast,

Published by Elsevier. This is the Author Accepted Manuscript issued with: Creative Commons Attribution Non-Commercial No Derivatives License (CC:BY:NC:ND 4.0).
The final published version (version of record) is available online at DOI: 10.1016/j.retrec.2019.100760. Please refer to any applicable publisher terms of use.

despite having a direct rail connection to Glasgow city centre, Prestwick is disadvantaged by its location, sited approximately 64km to the south of its nearest competitor (see Figure 1).

Figure 1: Map of Lowland Scotland

Source: adapted from ArcGIS

Historically Prestwick served as the principal international gateway for the region, as traffic distribution rules and air service bilateral agreements ensured that it had exclusive rights as the only airport able to host transatlantic scheduled flights from Scotland. When these restrictions were removed in 1990, transatlantic airlines switched their operations to Glasgow ensuring that it emerged and remained the preferred Scottish gateway for international services during the 1990s. The establishment of the Scottish Parliament in Edinburgh in 1999 and the growth of its financial services sector provided the extra stimulus behind a sustained and robust period of traffic growth post-2000 to such an extent that by 2007, it eclipsed Glasgow to become the busiest airport in Scotland.

Since 2007, there have been a number of important developments affecting the three airports. In 2008 the financial crisis and global economic recession had a significant impact on airport traffic levels across the world. During this period in the UK and more specifically in Scotland there were also significant developments in airport ownership. Both airports were incorporated into the state-owned British Airports Authority (BAA) during the 1970s. Joint ownership continued when the BAA was privatised in 1987. However, in 2009, the former UK competition authority (the Competition Commission) following an investigation, had concluded that such common ownership had given rise to adverse effects on competition and subsequently BAA was forced to sell Edinburgh in 2012. This was followed by BAA's successor

entity, Heathrow Airports Holding's (HAH), disposal of Glasgow in 2014. The ownership of Prestwick evolved differently. Whilst originally part of the BAA group when it was privatised in 1987, it was subsequently acquired by a number of different private owners. However, a recent decline in traffic and financial problems led to the airport being re-nationalised by the Scottish Government in 2013.

During this period of ownership change, other significant developments had been occurring within the European air transport environment. Airline and airport competition intensified, especially with the emergence of the low cost carrier (LCC) sector. In more recent years, the strategies of these LCCs, and the competing full service carriers (FSCs) and charter airlines have further evolved, having a major impact on the airports, including the Scottish ones, that they serve.

In light of changes in airport ownership and in the evolution of airline competitive strategies, there is a case for trying to understand how these developments have impacted on the nature of airport competition within the Scottish Lowlands region as this has implications for future airport ownership, economic regulation and other policies. Moreover, whilst quantifying the connection between airport growth and broader economic development remains problematic, it is widely acknowledged that this can be a positive relationship. Within this context, the Scottish Lowlands area is particularly interesting as it has experienced significant upturns and downturns in economic prosperity in recent years, particularly with Edinburgh's situation improving after the establishment of the Scottish Parliament in 1998, and Glasgow's relative decline due to contraction of surrounding heavy industries and manufacturing activities.

The nature of airport competition needs to be investigated not only through gauging the actual degree of airport competition but also in determining whether there has been a strengthening or weakening of competitive forces through time. In order to undertake this research, three key performance areas have been considered: the level/structure of airport charges, service quality and the development of traffic and routes from 2006 to the present day.

The structure of this paper is as follows. The next section provides the background context by presenting a literature review related to airport competition and the UK airport industry. This is followed by an identification of the performance metrics used and the data sources. The analysis is presented in Section 4 and Section 5 provides a general discussion that reflects on the analysis. Section 6 draws concluding comments.

2. Background literature review covering airport competition and UK airports

2.1 Airport competition

Airport competition has become an area of increasing interest within the research literature with many relevant and diverse issues being explored. Indeed, Forsyth at al. (2010) produced the first publication devoted to airport competition consisting of 26 chapters covering areas such as competition strength, traveller choice and policy decisions. Elsewhere, Barrett (2000) investigated competition between primary and secondary airports and LCCs, Graham (2006) considered competition within airports (e.g. with services and terminals) versus between airports, and Socorro et al. (2018) focused on airport and airline market power and the impact of carrier nationality.

Overall, the key driving forces of airport competition are increased liberalisation and deregulation which has presented airlines with much more freedom to operate from airports of their choice. This has provided airports with an opportunity to compete for traffic. The more liberal environment has also led to the emergence of new airline business models, most notably LCCs, which have proved to be challenging and somewhat footloose airline customers for airports as they seek to attract and maintain air services (Bush and Starkie; 2014; Gillen and Lall, 2004; Graham, 2013; Humphreys et al., 2006).

The competitive opportunities afforded by deregulation have had a transformative effect on airport business models. Many airports have matured into commercially sophisticated organisations developing a wide range of business development competencies most notably in marketing, route development and in delivering service quality. Increasing privatisation of airports has reinforced the need to pursue such commercially-orientated strategies. Moreover, the advance of privatisation, concerns with regard to airport market power and developing appropriate frameworks of economic regulation, has stimulated more discussion and debate on the extent to which airport markets are truly competitive. If the extent of competition is deemed to be insufficient, appropriate and alternative methods of economic regulation have been discussed and implemented, in order to substitute for competition and protect users against the potential abuse of market power (Bel and Fageda, 2013; Forsyth, 2006; Starkie, 2012).

There is a lack of agreement in the literature as to the degree to which competitive rivalry exists in the airport industry. Reports commissioned by Airports Council International (ACI) Europe, in advancing the commercial interests of its membership, favour light-handed regulation and they have presented evidence of a relatively high level of competition in airport markets (ACI-Europe, 2014; ACI-Europe, 2017; Oxera, 2017; Thelle et al., 2012). Thelle and la

Cour (2018) have supported these arguments, calling for competition constraints associated with economic regulation to be relaxed. Meanwhile, certain airlines and the International Air Transport Association (IATA) have argued vehemently against these opinions (e.g. IATA, 2013). Wiltshire (2018), in support of the airline position, challenged ACI's arguments, claiming that competition is limited in the airport sector and therefore there is a continuing need for robust economic regulation. Lieshout et al. (2016) argued that airport (and airline) competition in fact varies within Europe, being strongest in the UK, Benelux, Western Germany, Switzerland and Northern Italy. It is often with regional airports where the competitive forces can be particularly strong due to the existence of shared catchment areas, providing both airlines and passengers with the ability to choose between different local airports. This is very relevant for the Scottish airport case here.

An indication of the airport competitive environment can arguably be detected through the aeronautical charging policies established by airports (Bottasso et al., 2017). Indeed LeighFisher (2012) identified the extent to which competition is available, as well as the mix of airlines and routes served, as key drivers for airport charges and aeronautical revenue differentiation. Competitive pressures could well drive down prices and produce declining airport yields. There is evidence in both the US (Van Dender, 2007) and in Europe (Bel and Fageda, 2010) of lower aeronautical charging when airports face competition from neighbouring airports. Moreover, increased competition between airports has led to the widespread adoption of incentives offered for new or expanded services and sometimes bespoke agreements or contracts between airports and individual airlines (Halpern and Graham, 2016), one of the numerous examples being in Poland (Huderek-Glapska and Nowak, 2016). Such deviation from standard airport published charges is becoming increasingly common in Europe (Fichert, 2019; Jones et al, 2013; Malina et al, 2012). In fact, Jankovic declared that 90% of all members of ACI-Europe offered some type of discount, whilst in the US, Ryerson (2016) in a study of 70 airports, found that incentives were offered by 63% of them.

Another indication of airport market competitive intensity is through the growing focus on service quality improvement as it can be argued that rival airports will deploy additional effort and resources in improving facilities and process efficiency in order to attract more airlines and passengers (OECD, 2014). Whilst the literature in this area is relatively scarce, Prentice and Kadan (2019) recently found that airport service quality was significantly related to airport re-use, while Kim et al (2016) observed a similar connection with passenger satisfaction.

Clearly the successful airport competitive strategies will also be reflected in their traffic development. Strong growth in traffic can indicate the efefcts of airport rivalry where airlines have been incentivised to establish new services or expand existing networks and their passengers are encouraged to fly more frequently. New airlines and new routes can provide passengers with more airport choice. Moreover route churn which may involve passengers or airlines switching between different airports, or airlines exiting routes or abandoning airports entirely, can help demonstrate the true substitutability of competing airports. Indeed, in relation to route churn, Thelle at al. (2012) found that in 2011 around 2,500 new routes were launched in Europe compared 2,000 closures and every year around 20 per cent of the total were route openings compared to 15 per cent closures. Route churn, particularly in relation to LCCs was also observed to be intensifying in Europe by De Wit (2016). An analysis of traffic shifts within airport catchment areas can additionally help to assess the competitive forces that exist (Pantazis and Liefner, 2006; Lieshout, 2012) by giving more insight into passenger choice factors.

Further understanding is also provided by exploring airport competition from the users' (e.g. airlines, passengers) perspective, and in particular by analysing those factors that influence their choice of airport. For example, Dziedzi and Warnock-Smith (2016) found that the most important factors influencing LCC choice of airport were airport costs, demand and catchment area, and efficient operations. These can be linked to the discussion above concerning charges, traffic development and service quality. For passengers, airport choice is that much more complicated in the sense that it is driven to some extent by the nature of air services that are offered (in terms of fares, destinations, schedules etc.) – in effect the airline product – will be the key salient factor as it is unlikely passengers will chose an airport unless it offers the required travel opportunities. However, factors including: distance, the cost and ease of surface access to a certain airport, as well as price and convenience of car parking, can also be very important to passengers. Research consistently shows that the nature of air services and airport accessibility are the most salient choice factors (CAA, 2011; Mohammed and Roisman, 2017). Some contributions have applied more sophisticated approaches using discrete choice models to understand combined choices relating to airlines, airports and surface access (Hess et al., 2007; Garrow, 2010).

2.2 The UK airport market

The UK airport industry was the first in the world to privatise airports when it passed the 1986 Airports Act (Humphreys, 1999). In 1987, the then British Airports Authority which owned Aberdeen, Edinburgh, Glasgow, London Gatwick, London Heathrow, London Stansted, Prestwick and Southampton was floated on the London stock exchange as a single entity to become the fully-privately owned company BAA. The legislation also required that all local municipal-owned regional airports generating over £1 million in annual turnover, were to be established and managed as limited liability companies. This, in essence, was the first step in their transition to privatisation. In the following 25 years all the main regional airports became either fully or partially privately operated (although two have also returned to public ownership). This, in combination with the overall growth of traffic, particularly due to liberalisation and the development of the LCC sector, means that UK regional airports have reached a stage of maturity having become accustomed to operating in a more commercial and competitive environment (Starkie, 2008; Ison et al. 2011).

With regards to BAA, there was considerable debate prior to its sale as to whether the airports should have been sold individually or collectively as a group (Littlechild, 2018). Arguments in favour of collective privatisation included the potential advantages that stem from economies of scale, financial robustness and resilience achieved through its size, the diversity of its the assets and the sharing of technical and managerial expertise across the group. Arguments against collective privatisation tended to focus on the potential loss of benefits that could have accrued from airport competition (Graham, 2009; Toms 2004). In spite of several UK Government reviews which re-visited these arguments, BAA's quasi-monopoly continued unchallenged until 2009. Commercial interest and expediency rather than competition policy prompted the sale of Prestwick in 1992 to the Canadian entrepreneur Matthew Hudson following the loss of transatlantic airline operations to Glasgow. The airport consequently experienced a sharp decline in traffic before a renaissance was engineered by Hudson following the establishment and subsequent expansion of a Ryanair base in the mid-1990s. Prestwick was sold on to the Scottish transport operator Stagecoach in 1998 and then to Infratil, the New Zealand infrastructure investment company, in 2001.

However, the major turning point for BAA was in 2009 when following another review of its market power, the Competition Commission (now known as Competition and Markets Authority (CMA)) concluded that its common ownership of airports in the South-East of England and Scotland was detrimental to competition (Competition Commission, 2009; Bush 2009). As a consequence, BAA was ordered to sell Gatwick (sold in 2009), Stansted (sold in

2013) and Edinburgh or Glasgow (Edinburgh sold in 2012). In 2016, the CMA, with the help of its consultants ICF, undertook a detailed assessment of the effects of the airport divestments (CMA 2016; ICF 2016). The report was able to identify a number of factors that suggested that competitive rivalry had intensified since divestment, manifested in changes to the structure of aeronautical charges, improvements in service quality (observed at Gatwick and expected at Stansted/Edinburgh) and greater passenger growth compared to other airports following the adoption of more intensive efforts to attract new airlines.

Meanwhile, Infratil decided to sell Prestwick Airport in 2012 owing to its deteriorating commercial and financial performance largely as a consequence of Ryanair's decision to transfer a significant volume of its operations to Glasgow. Fearing the potential wider economic and employment consequences of closure, it was bought by the Scottish Government for a nominal price of £1 in November 2013 (Auditor General, 2015). HAH (BAA's successor entity) the owner of the rump of airports that had not been divested, took a decision to focus on its core asset Heathrow and subsequently sold off its remaining airports including Glasgow in 2014. Ownership of Glasgow, as well as the other HAH Scottish airport Aberdeen was transferred to AGS, with 50% being owned by Ferrovial which also had a significant shareholding (25%) in HAH (BBC, 2014).

In parallel to these changes in ownership, there were also important developments in relation to traffic growth, the evolution of LCCs operations and shifts in airline and airport strategies, and this has been subject of some interesting research (e.g. Civil Aviation Authority (CAA), 2005, 2007; Papatheodorou and Lei, 2006; Halpern et al. 2016; Lei and Pagliari, 2013, Halpern and Graham, 2017). It is clear from this evidence base that the operating and competitive environment for each individual regional UK airport had varied enormously and as a result, their performance and achievements through time had been very different. However, there has been very little detailed consideration of the Scottish airports, except the contribution by Pagliari (2005) on international route development. Therefore, this paper goes some way in addressing the literature gap.

3. Choice of Performance Metrics

Buildling on the literature review, an analysis of aeronautical charging, service quality performance and traffic development has been chosen to assess the extent and development of competition within the Scottish Lowlands region. Key performance metrics for these areas (traffic development has been divided into traffic growth, route development and catchment area analysis) have been defined in Table 1 and accompanied by the data sources used. The

metrics focus very much on the airport's perspective of competition, and so are very similar to those adopted in the studies of ICF (2016) and CMA (2016), rather than looking at broader issues related to airline and passenger choice factors that were also mentioned in the literature review.

Table 1: Analysis areas and data sources

	Analysis areas 2006-2018/(financial values in real terms)	Data sources
1	Aeronautical charging: Turnaround airport charges Landing charges International and domestic passenger charges Aeronautical revenue per passenger/aircraft movement	Published airport charges from the airport's websites, airport annual reports
2	Service quality performance: ACI ASQ passenger satisfaction scores Which? travel passenger satisfaction scores	Airport annual reports, ICF (2016), Which? UK airport reports (as published in the Which? Travel Magazine)
3	Traffic growth: Total, domestic, EU and non-EU passenger growth, market share	CAA airport statistics
4	Route development: Number of routes Route churn Unserved routes	OAG schedule data, The Route Shop website
5	Catchment area analysis: Top ten regions served by Edinburgh and Glasgow airport	CAA airport surveys

For aeronautical charging, initially all charges incurred on an aircraft turnaround are considered. This is very much influenced by landing and passenger charges, which account for the majority of aeronautical revenues, and so these are also investigated separately. However, these measures only show the published airport charges and not the discounts and incentives that airports are increasingly offering. An assessment of actual aeronautical revenue per passenger/aircraft movement, as frequently used in airport economic performance literature, was used to measure this.

As regards service quality, it is difficult for researchers to obtain sufficient data and insights on service quality at different airports. Data and performance metrics remain largely proprietary. The online customer service ratings platform Skytrax is accessible, but the sample size of customers submitting their views at the three Scottish airports is small and varies considerably. Indeed, it is doubtful whether Skytrax can be considered as a reliable source given the greater degree of subjectivity and bias in the data. Some limited evidence can, however, be accessed from the surveys of ACI ASQ and Which?. The ASQ is arguably the most

well-known, extensive and dependable source, but only the airports themselves have access to most of the data. The Which? data is a useful source that is not often used in academic research and so provides additional insight. Which? is a reliable and well-established consumer organisation, with a sample size of over 11,000, albeit limited to Which? Subscribers only (Which?, 2019a; 2019b). The UK CAA has also started to report overall passenger experience ratings from their annual airport surveys but data is only available for the last two years.

Traffic development data which is more consistent and more easily accessible was used to provide both demand and supply dimensions. Passenger volumes, segmented by key markets, reveals the nature of demand, whereas supply is represented by route development metrics. These measures have been widely used in similar research, whereas catchment area analysis, which links traffic generation to the surrounding geography, is more uncommon as the CAA data is a rare example where such data is freely available and based on reliable and extensive surveys.

For most of the analysis, a time horizon 2006-2018 was selected. This 13-year dataset was considered to be long enough to assess the impact of recent developments. 2006 was chosen specifically to provide at least two comparatively 'normal' years before the onset of the global recession. Moreover, since major ownership changes occurred in 2012-2013, the time horizon selected provides for a more balanced and comprehensive perspective before and after these developments.

4. Analysis

4.1 Aeronautical charging

The first part of the analysis involves a comparison of the aeronautical charges levied at the three Scottish airports (Table 2). Comparative charges levels are assessed by aggregating the individual charges that are levied for a given aircraft turnaround operation (arrival and departure) based on fixed and common assumptions relating to aircraft type, passenger load factor, parking time and the number of bags. This approach is known as the turnaround cost method as it sums all the charges that are incurred in an aircraft turnaround (landing, on ground, departure). The A320 aircraft has been chosen with an assumed load factor of 85% and parking time on the stand of 60 minutes as this is fairly typical of the aircraft operations at these airports. It is also assumed that the aircraft turnaround involves an arrival from and departure to an international airport in another EU member state.

It is evident that Edinburgh is the most expensive airport, followed by Glasgow and then Prestwick, providing some evidence of price divergence and competitive rivalry between the

three airports. The passenger charge is by far the most important in revenue terms, followed by the landing charge and so both of these are given more detailed consideration.

Table 2: Turnaround airport [1] charges at Edinburgh, Glasgow and Prestwick 2018-2019

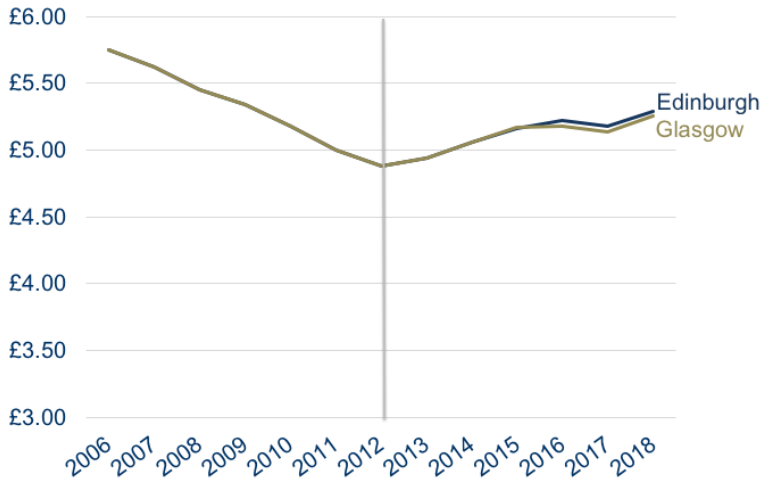
	Edinburgh	Glasgow	Prestwick
Landing charge	£429.98	£416.01	£339.57
Parking charge	£24.99	£17.28	£0.00
Passenger charge	£2,425.04	£2,053.26	£1,666.17
Terminal navigation charge	£355.01	£342.51	£226.38
Persons of Reduced Mobility (PRM) charge	£82.62	£80.02	-
Police and aviation security charge	£61.20	-	£336.60
Baggage hall and screening charges	£113.22	£125.46	£38.25
TOTAL	**£3,492.05**	**£3,034.24**	**£2,606.97**

[1] Based on an A320 (MTOW 73.5), seat capacity 180, load factor 85% (passengers 153), parking time 60 minutes and 77 hold bags.

Source: Edinburgh, Glasgow and Prestwick airports conditions of use documents 2018-2019.

In Figures 2 and 3 we compare individual landing and passenger charges for Edinburgh and Glasgow over the period 2006 to 2019.

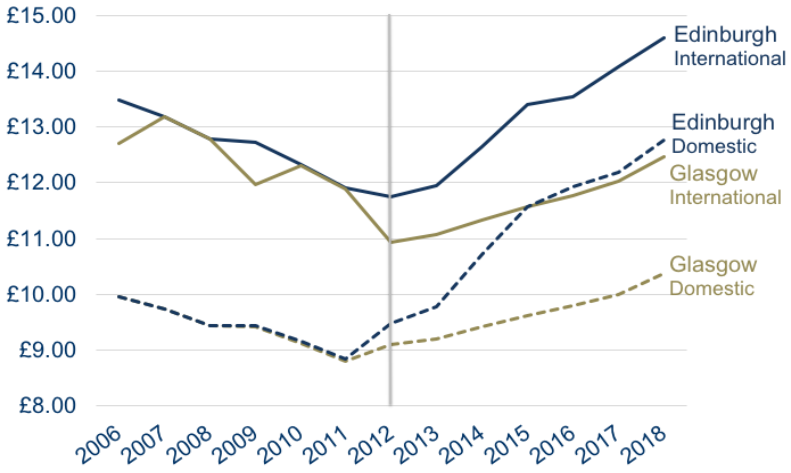
Figure 2: Landing charge per tonne of MTOW at Edinburgh and Glasgow airports 2006-2018



Source: Edinburgh and Glasgow conditions of use documents 2006-2018

Figure 3 shows that, in contrast to the landing charge, a significant and distinct deviation emerged between the two airports with respect to the trajectory of published per passenger charges.

Figure 3: International and domestic per passenger charge at Edinburgh and Glasgow airport 2006-2018



Source: Edinburgh and Glasgow conditions of use documents 2006-2018

Under BAA ownership between 2006 and 2012, charges were fairly similar and as with the landing charge, there were notable real-term reductions. There was, however, a sharper decrease in the international passenger charge at Glasgow in 2009 possibly as a reaction to weaker market conditions following the 2008 financial crisis. Since 2012, charges have not only increased but they also have also diverged substantially, rising at a much faster rate at Edinburgh compared to Glasgow. This is especially with regard to the domestic charge which increased by a factor of 35% in real terms since 2012 at Edinburgh airport.

As discussed in the literature review, many airlines do not pay the full published rates. Instead, they often negotiate a discount as an incentive offered by the airports to attract new or expand existing air services. They may go even further by entering into longer-term bespoke negotiated agreements with airports that involve a degree of risk-sharing where charges are linked to incentives around the airline's delivery of traffic and capacity. Prestwick has such an agreement with Ryanair and indeed on the airport marketing website 'The Route Shop', the airport states (The Route Shop, 2019):

> *'Glasgow Prestwick offers airlines a 'one stop shop' offering with highly competitive deals and packages to include: Landing and navigation, Terminal Infrastructure, Security, Passenger Handling, Aircraft Handling. Charges can be structured on a per departing*

passenger basis (no MTOW charges) which shares the risk by only charging for passengers onboard. Offering the best deal available within the Scottish market'

Generally, incentives that offer no landing charge are popular, because of the identified reduced risk for the airline (but consequently greater risk for the airport). Edinburgh and Glasgow airports also state in their conditions of use documents that they offer incentives, but no further details are provided.

As discussed, average aeronautical revenue per traffic unit, otherwise known as aeronautical yield, can take into account these incentives and individual negotiated rates, and so is arguably a more accurate measure of actual price than the published tariffs. This represents the average price that is paid by all operations at an airport by dividing the total aeronautical revenue in a financial year by the volume of traffic units (passengers or air transport movements). However, it is important to recognise that one of the limitations inherent in using yield to represent average price, is that movement over time will not only reflect alterations in charging policy but equally shifts in traffic mix and possible strategies designed to differentiate between routes, airlines and passengers that the airport may wish to attract. The movement of aeronautical yield over time is shown in Figures 4 and 5. with the former based on passenger volume as the traffic denominator and the latter based on aircraft movements.

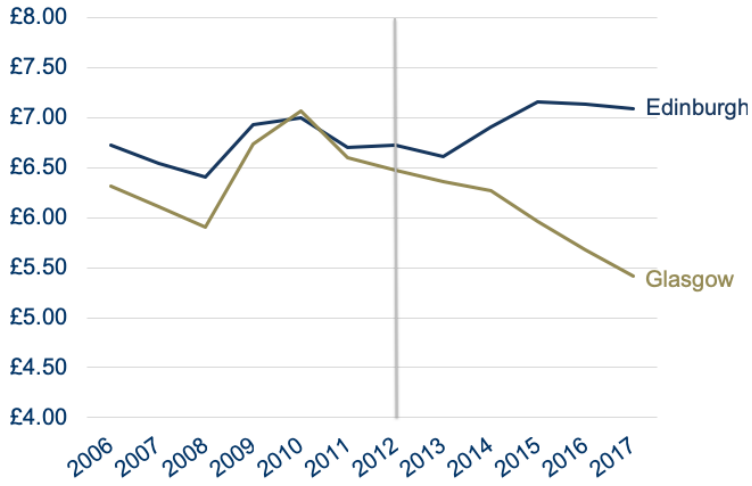
Regarding passenger-based yield, Prestwick was excluded because of the very different mix of traffic handled by the airport. The airport has historically served the non-regular passenger market, a segment that has become especially more prominent since 2008 because of the significant decline in passenger-related activity. It would therefore be misleading to compare passenger-based yield with Glasgow and Edinburgh because at those airports, traffic mix has historically remained quite stable with a substantial proportion accounted for by regular scheduled and charter services.

According to Figure 4, passenger yield has followed a broadly similar trajectory to that of the published rates, in that the overall level of charges is higher at Edinburgh, especially after 2012. By contrast, whilst published prices declined in real terms between 2008 and 2010, aeronautical yield increased at both airports.

However, this period coincided with reductions in passenger numbers at both airports, which may partly explain higher aeronautical yield as the dominant passenger charge is directly linked to passenger numbers. Subsequently yields at Edinburgh rose marginally (very broadly moving in a similar direction as published charges) whereas Glasgow's yield declined significantly suggesting a much more extensive use of discounts. Indeed, what is striking is

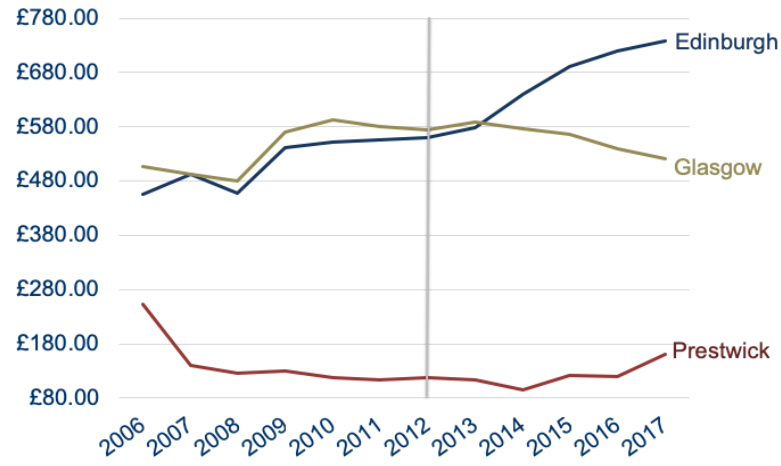
that the gap between both airports in terms of average passenger yield has widened considerably since ownership separation in 2012.

Figure 4: Aeronautical revenues per passenger in real terms at Edinburgh and Glasgow airport 2006-2017



Source: Annual reports and accounts for Edinburgh International Airport Ltd and Glasgow International Airport Ltd

Figure 5: Aeronautical revenues per aircraft movement at Edinburgh, Glasgow and Prestwick airport in real terms 2006-2017



Source: Annual reports and accounts for Edinburgh International Airport Ltd, Glasgow International Airport Ltd and Prestwick International Airport 2006 to 2017

When aircraft movements is used as the yield denominator, Prestwick is included and what is observed is the considerable gap that has existed with its competitors since 2006 and has become especially more apparent since 2012.

4.2 Service quality performance

It is usually assumed that within competitive markets that there are strong incentives for airports to maintain or enhance service quality. In the the ACI ASQ survey, passengers rank their level of satisfaction from 1 (very poor) to 5 (excellent). In Table 3, scores out of 5 have been converted into percentages (data before 2010 was not available, nor for Prestwick).

Values at Edinburgh were consistently higher than at Glasgow. Overall at both airports satisfaction rates improved over the period, although Edinburgh experienced a dip in 2013 and 2014. Which? travel also produced scores for the three airports for 2008, 2011 and 2014-2018 (just the early years for Prestwick). Whereas up to 2015 similar observations can be made as with the ACI ASQ results (i.e. scores increasing at Glasgow and Edinburgh, with higher scores at Edinburgh), in the period that follows, trajectories are not so clear, with Glasgow overtaking Edinburgh as the best ranked airport and with some declines as well as improvements in satisfaction scores. By contrast, satisfaction levels obtained by the CAA for 2018, which have not be available for previous years, show Glasgow and Edinburgh having almost identical scores when converted to percentages of 85% (CAA, 2019) which further complicates what appears to be a rather mixed and inconsistent message with regard to service quality between airports in the region. For the limited years when scores for Prestwick airport are available, satisfaction levels also seem to be improving and in 2011 and 2014 were similar to those at Glasgow airport.

Table 3: Passenger satisfaction measures at Edinburgh, Glasgow and Prestwick airport 2008-2018

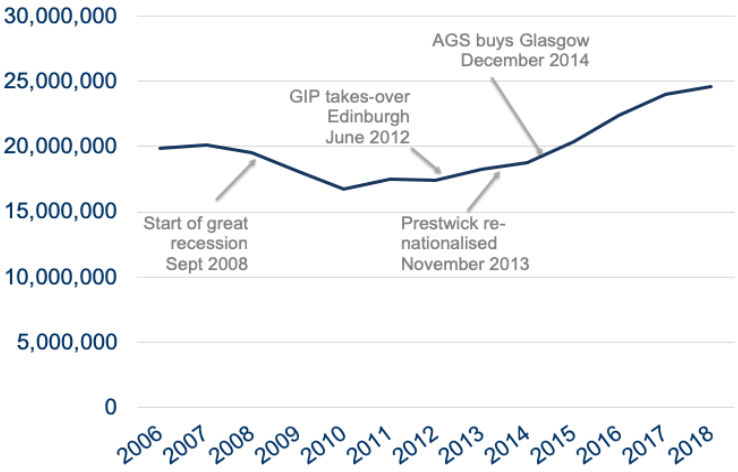
Year	ACI ASQ survey		Which? travel survey		
	Edinburgh	Glasgow	Edinburgh	Glasgow	Prestwick
2008	n/a	n/a	55	50	46
2009	n/a	n/a	n/a	n/a	n/a
2010	80.0	77.2	n/a	n/a	n/a
2011	82.0	78.0	60	54	53
2012	83.8	79.6	n/a	n/a	n/a
2013	82.0	79.2	n/a	n/a	n/a
2014	82.1	80.8	63	57	58
2015	85.6	82.0	63	62	n/a
2016	85.8	81.8	59	64	n/a
2017	87.2	82.0	56	59	n/a
2018	n/a	n/a	59	63	n/a

Source: Annual reports and accounts for Edinburgh International Airport Ltd and Glasgow International Airport Ltd 2010 to 2017, ICF (2016), Which? travel UK airport survey 2008 to 2018

4.3 Traffic growth

Figure 6 shows combined terminal passenger volumes at the three Scottish Lowland airports between 2006 and 2018. Overall there has been growth, but the effect of the financial crisis and economic recession in 2008-2010 is clearly apparent. In the latest year 2018, overall traffic grew although there was a slight decline at Glasgow (the first since 2010) and Prestwick.

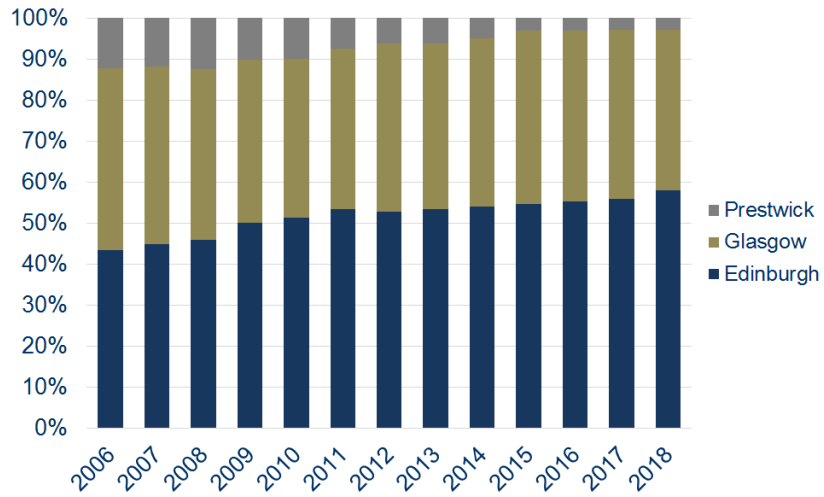
Figure 6: Terminal passengers at Edinburgh, Glasgow and Prestwick airport 2006-2018



Source: CAA airport statistics 2006-2018

Figure 7 illustrates very clearly how Edinburgh has increased its market share (43% to 58%) – becoming the busiest airport in 2007 - whilst Prestwick's share has declined significantly (12% to 3%), and now only represents a very marginal proportion of the total market. Glasgow's share has declined slightly from 44% to 39%, seemingly gaining traffic from Prestwick but losing to Edinburgh.

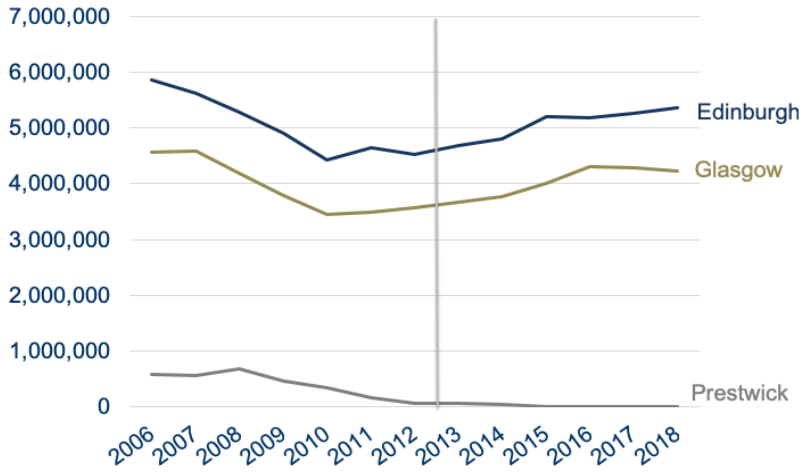
Figure 7: Market share (%) of Edinburgh, Glasgow and Prestwick airport 2006-2018



Source: CAA airport statistics 2006-2018

Overall volumes of domestic traffic have declined between 2006 and 2018 and at Prestwick there are no longer any domestic services (Figure 8).

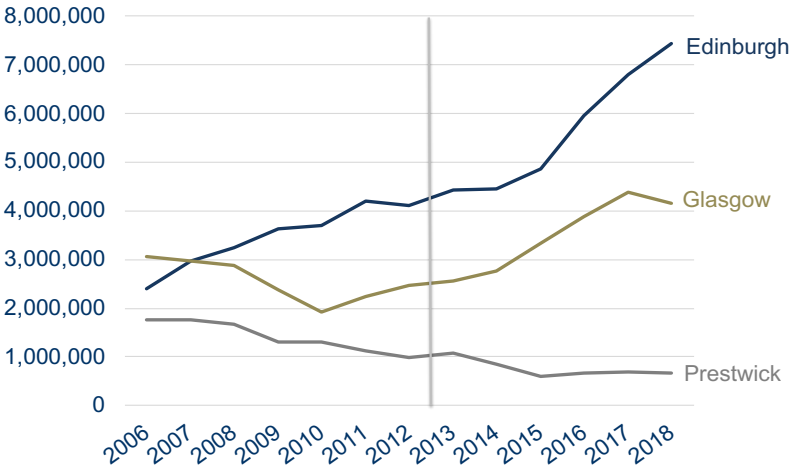
Figure 8: Domestic terminal passengers at Edinburgh, Glasgow and Prestwick airport 2006-2018



Source: CAA airport statistics 2006-2018

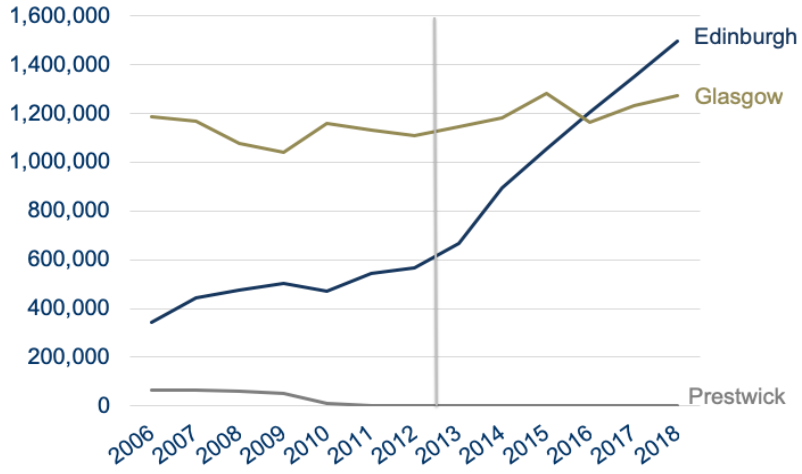
However, this has been offset by much faster growth in international EU traffic, steadily at Edinburgh, and after the economic recession at Glasgow (albeit that there was a slight decline in 2018). By contrast, Prestwick has seen a continuous decline in this market. One of the most dramatic changes has been the growth in non-EU traffic at Edinburgh, eclipsing Glasgow in 2016 as the gateway of choice for this market segment. Prestwick has now lost all its non-EU traffic (Figure 9 and 10).

Figure 9: EU terminal passengers at Edinburgh, Glasgow and Prestwick airport 2006-2017



Source: CAA airport statistics 2006-2018

Figure 10: Non-EU terminal passengers at Edinburgh, Glasgow and Prestwick airport 2006-2018

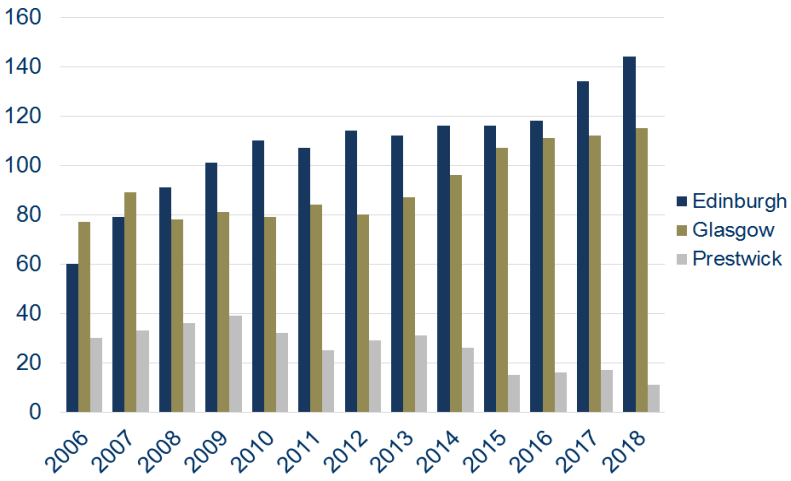


Source: CAA airport statistics 2006-2018

4.4 Route development

Figure 11 which shows the number of routes served by the three airports between 2006 and 2018 broadly mirrors growth trends also observed with regard to passenger traffic. Edinburgh has overtaken Glasgow in terms of the total number of routes. In 2018 it served 144 compared with 115 at Glasgow.

Figure 11: Total routes at Edinburgh, Glasgow and Prestwick airport 2006-2018

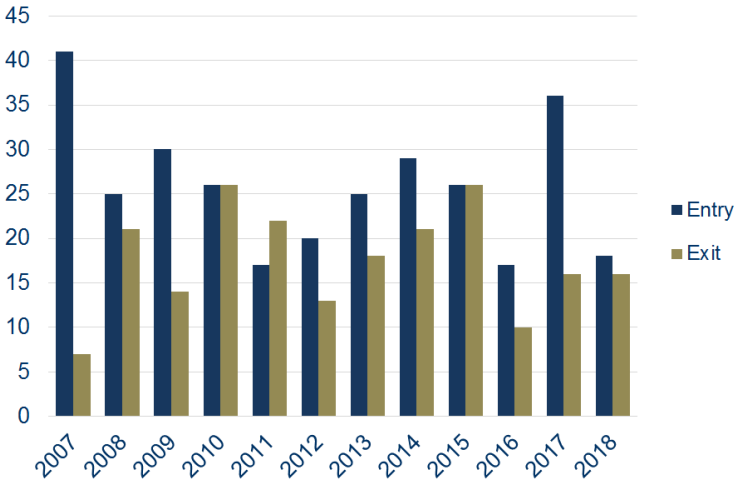


Source: Flight Global OAG Analyzer

The number of routes at Prestwick has declined from 30 in 2006 to only 11 in 2018. However, it is important to note that this only covers scheduled traffic but not charter flights. At Edinburgh, the charter market is insignificant as in 2006, 96% of traffic was carried on scheduled services, this had increased to 98% by 2017. In contrast, charter operations have always accounted for a higher proportion of traffic at Glasgow (9% in 2017) - although there has been a marked decline in this market segment's share of traffic from a level of 22% in 2006. The demise of charter operations is a phenomenon common to many other markets where there has been a significant loss of market share to LCCs.

Growth in the number of routes served is not necessarily a reflection of the effects of increased competition. One approach is to calculate 'route churn', i.e. the number of air carrier route entry and exists at each airport for a given year. Figure 12 shows that there was a considerable level of route churn at the three airports between 2006 and 2018, suggesting competitive pressures, but there is no overall apparent trend that could indicate whether these pressures had increased or decreased over the years. Edinburgh airport was primarily responsible for the notably high levels of new routes in 2007 and 2017, whereas Prestwick experienced more losses of routes than the other airports in 2010 and 2015 when route closures were the most significant.

Figure 12: Route Churn (entry and exit of routes) at Edinburgh, Glasgow and Prestwick airport 2006-2018



Source: Flight Global OAG Analyzer

Thirty-two routes were served by both Glasgow and Edinburgh in 2006. By 2018 an additional 24 routes were shared by both airports. Increased duplication of destinations by the two

airports could arguably be interpreted as a reflection of heightened competitive intensity. Interestingly in 2006, Prestwick and Glasgow shared six routes and by 2018 this has increased to eight.

Both Edinburgh and Glasgow have respective entries in the webpages of the marketing website 'The Route Shop' which lists potential new routes that each airport aspires to develop. Given that Prestwick has lost many routes in recent years, it is not surprising that it identifies the largest number of routes (22) that could be served. Most of these are within Europe or Turkey but included on the list is also Boston and Orlando, demonstrating an ambition to once again serve the transatlantic market. Glasgow lists 10 routes, three of which are links to destinations in China. Similarly, amongst the 19 target routes identified by Edinburgh, three are in China with a further five proposals to link with airports located in other East Asian states. Overall, only three of the routes are in Europe, indicating an ambition to expand further in the non-EU market segment. Several target routes have been listed by more than one Scottish airport (Boston, Brussels, Copenhagen, Hong Kong, Istanbul, Madrid, Orlando, Shanghai and Stockholm), suggesting the ability of these airports to potentially compete for services to these destinations.

Table 4: Routes unserved shown on 'The Route Shop'

Edinburgh airport (*)	**Glasgow airport**	**Prestwick airport**
19 routes	10 routes	22 routes
Bangkok, Bergen, Boston, Bremen, Bridgetown, Bucharest, Delhi, Guangzhou, Hannover, Hong Kong, Las Vegas, Los Angeles, Luxembourg, Moscow, Mumbai, Orlando, San Francisco, Shanghai, Tokyo.	Beijing, Boston, Brussels, Copenhagen, Hamburg, Hong Kong, Istanbul, Madrid, Shanghai, Stockholm.	Belfast, Boston, Brussels, Copenhagen, Cork, Dalaman, Dusseldorf, Frankfurt, Geneva, Gothenburg, Istanbul, Lisbon, London, Madrid, Munich, Orlando, Oslo Paris, Prague, Southampton, Stockholm, Zurich.

(*) Edinburgh airport also identifies two underserved routes, Vienna and Zurich
Source: The Route Shop (2019)

4.5 Catchment area traffic

The three airports attract passengers from many regions in Scotland, the majority originating from the Lowlands. Edinburgh airport arguably enjoys some accessibility advantages over its rivals. Being located to the west of the City Centre, makes it closer and more accessible to

markets to the West of the lowlands such as Glasgow and its metropolitan region (see Figure 1). In contrast, Glasgow airport is located to the west of Glasgow City Centre making it less accessible to residents of Edinburgh and East-Central Scotland.

Catchment area statistics have been obtained for the time period under consideration (2009 and 2013) but only for Edinburgh and Glasgow. The top ten regions that generated the most traffic in 2013 were the City of Edinburgh, Glasgow City, Fife, South Lanarkshire, West Lothian, Renfrewshire, North Lanarkshire, Perth and Kinross, Stirling and Dundee City. Edinburgh's market share for all these regions increased between 2009 and 2013 (with the exception of West Lothian) tentatively suggesting that one of the reasons for Edinburgh's superior growth performance in recent years has been its ability to attract residents that traditionally preferred to fly from Glasgow (Table 5).

Table 5: Top ten regions served by Edinburgh/Glasgow 2013 and Edinburgh market share 2009/2013

Scheduled passenger numbers (x000) by region	Edinburgh 2013	Glasgow 2013	Total 2013	Edinburgh Market Share (%) 2009	Edinburgh Market Share (%) 2013
City of Edinburgh	4,761	120	4881	95	98
Glasgow City	362	2,153	2515	7	14
Fife	963	70	1033	89	93
South Lanarkshire	126	493	619	18	20
West Lothian	446	65	511	91	87
Renfrewshire	31	461	492	2	6
North Lanarkshire	121	333	454	23	27
Perth and Kinross	360	71	431	77	84
Stirling	253	111	364	63	70
Dundee City	276	71	347	73	80

Source: CAA passenger survey report 2009 and 2013 (the 2018 report does not contain this data)

5. Discussion

Undoubtedly there have been some interesting developments in relation to the aeronautical charging strategies that have been adopted by the three Scottish airports. To some extent, these strategies relate to common ownership under BAA and the subsequent divestiture of Edinburgh airport. Common ownership ensured that there was consistency and uniformity in the published charges levied by both Edinburgh and Glasgow. During the period 2006-2012 BAA ensured that year-on-year real terms reductions in charge levels were achieved. This may not have been entirely commercially-driven in the sense that BAA appeared to be deliberately lowering the risk of regulatory price control intervention through imposing on itself a

voluntary price-cap of RPI-3% on average aeronautical yield (Competition Commission, 2009).

Following the sale of Edinburgh airport, charging strategies did change indicating the presence of stronger competitive forces. Published charges increased at both Edinburgh and Glasgow, which seems counter-intuitive as in a more competitive environment one would have expected them to be lower. However, charges at Edinburgh (particularly those that were passenger-related) rose more rapidly than at Glasgow. This may well reflect the airport's intention, once separated from common ownership, to seize the opportunity to re-set its pricing strategy with reference to underlying market conditions where lower price-sensitivity (see the discussion below) limits the risk of losing market share to Glasgow. Meanwhile at Glasgow airport published charges also increased but not at the same rate as Edinburgh. This could indicate that as Prestwick's business prospects had deteriorated post-2008, diminishing its competitive threat, Glasgow seized an opportunity to its raise aeronautical charges. Another interpretation of this is simply that charges increased after 2012 as both airports were no longer bound by the voluntary price-cap. If accepted, this argument gives credibility to the airline industry's argument that economic regulation of airports is justified and needed (IATA, 2013) in contrast to ACI-Europe's opinion that is not necessary (ACI-Europe, 2017).

Analysis of aeronautical yield provides further insight into pricing strategy. While published charges were rising at Glasgow, yield had declined, which perhaps reflects the impact of discounting effects where, unlike at Edinburgh, there are weaker more price-elastic market conditions. Unfortunately, a knowledge gap exists with regard to Prestwick airport as it not possible to assess to the fullest extent its aeronautical charging strategy due to the existence of a negotiated contract with its main customer Ryanair and the different mix of traffic in any yield calculation. Nevertheless, the limited evidence available does suggest that charges at Prestwick were and still are the lowest of all the three airports which is what would be expected given weaker business prospects relative to its larger competitors.

In terms of service quality, it is difficult to draw firm conclusions, due again to the limited evidence that is available. Generally, satisfaction rates improved during the period, which could well reflect a more competitive environment with airports seeking to enhance service levels in order to attract more airlines and passengers. One important aspect of measuring service quality is that there may be a lag-effect in any analysis since passenger satisfaction rates may decline during phases of construction and refurbishment in advance of new facilities becoming operational. Indeed ICF (2016) noted that at Edinburgh there was a decline in

passenger satisfaction rates in both 2013 and 2014 due to short-term effects of capital investment on service delivery.

With regards to traffic development, whilst there is a considerable overlap in the catchment areas served by the airports, Edinburgh in particular serves a very different core market compared to Glasgow and Prestwick. In addition to functioning as the administrative and political capital of Scotland, Edinburgh is also a significant centre for banking and finance, and possesses several internationally recognised and popular tourist attractions. In 2013 (the last year data is available), 31% of its passenger market was business-related, which represented the highest share of any UK airport with the exception of London City (56%) and Aberdeen (61%). Forty per cent of its international leisure traffic was inbound which again was unusually high for a UK regional airport (CAA, 2014).

By contrast, in terms of air travel propensity, Glasgow airport has a weaker catchment area, with the region having traditionally depended on heavy industries and the manufacturing sector for much of its wealth. With the decline of many of these industries, there have been ensuing economic consequences for the region in the form of higher than average unemployment and lower than average disposable income. Glasgow is, therefore, more dependent than Edinburgh on the leisure market and LCC operation. In 2013, outbound leisure travel represented 77% of its traffic. In 2009, Prestwick had the lowest share of business traffic (8%) with a more proportionally significant inbound leisure travel dependency than Glasgow, representing half its outbound figure (CAA 2010, 2014). Prior to the 2008 financial crisis, the main carrier Ryanair was, in effect, the sole operator at Prestwick offering connections to a range of destinations including secondary airports located in key European metropolitan areas and airports serving traditional short-haul Mediterranean holiday resorts. Ryanair's retrenchment at Prestwick, which was part of a wider network strategy to migrate operations to primary airports, led to the loss of several connections in 2018 leaving a very limited range of seasonal services to holiday destinations.

Under common ownership, it has been claimed that BAA managed both airports as differentiated products offering Edinburgh as a business-focussed airport while Glasgow was presented as a predominantly leisure market facility. As such, little effort was made to develop any form of competitive rivalry between the two (CMA, 2016). By contrast, Prestwick and Glasgow have always been considered much more as direct competitors in recent years, largely due to Ryanair's expansion of its Prestwick base which it opened in 1997. Passenger volumes at Prestwick peaked at above two million passengers between 2005 and 2008. Although Prestwick is disadvantaged in terms of its distance from key population concentrations, this

was to some extent offset by the availability of a direct rail connection; its smaller size and lower airport costs' these being important features which initially attracted Ryanair to serving the airport (Pagliari, 2005).

The traffic analysis from 2006 shows that overall passenger numbers were affected by the economic recession of 2008-2009, but the impact was less pronounced at Edinburgh compared to Glasgow. This could well be due to Edinburgh's lesser dependence on the outbound leisure passenger segment. There was also a terrorist attack at Glasgow airport in 2007 which might have temporarily dampened traffic flows. Consequently, after this period the overall traffic levels at both Edinburgh and Glasgow have increased significantly, tentatively suggesting a strengthening of the competitive forces between them.

Meanwhile Prestwick's traffic has followed a virtually continuous downward trend in recent years with no domestic services and just a small number of EU connections remaining. Significantly in 2014, Ryanair opened a Glasgow base with the launch of seven routes, in line with its practice elsewhere of moving into larger airports. This followed other airlines, such as Wizz, who shifted services from Prestwick in 2013. With less than 3% overall market share and only around 10 routes left, Prestwick's ability to compete with the other airports appears to have weakened considerably.

Pricing trends observed at Edinburgh and Glasgow suggests that the airports have recognised the significant differences in price elasticities that exist in their respective markets. It appears that the sizeable charge increases at Edinburgh have had no evident impact on the robust and sustained traffic growth than has been observed there since 2012, suggesting that the airlines are willing to pay higher charges for the market advantages that Edinburgh offers, rather than using the demonstrably cheaper Glasgow airport. Interestingly, in February 2018 Ryanair announced that it was transferring most of its Glasgow services to the more expensive Edinburgh airport for winter 2019 (although no information is available concerning the deal that has been agreed), while still maintaining limited operations from Glasgow (and Prestwick). The main reason for this shift the airline claimed was the high cost of the air passenger duty tax, although this still has to be paid on routes flying from Edinburgh (anna.aero, 2017). This means that it joined other LCCs such as Norwegian, Germanwings, Transavia and Vueling who decided to use Edinburgh as their preferred airport. This loss of routes for part of the year may partly explain the slight drop in Glasgow traffic in 2018. However, Ryanair announced in November 2018 that it would be re-instating in 2019 four of the 20 routes out of Glasgow Airport which it had cut - adding to the three routes remaining. This clearly demonstrates the fluid competitive situation that exists between the two airports.

The migration to Edinburgh is a reflection of the fact that many airlines, because of the nature of the market and the characteristics of the core catchment appear to be able to generate higher air fare yields by operating air services there compared to Glasgow.

The increase in non-EU passengers and long-haul routes at Edinburgh could be interpreted as Edinburgh becoming more competitive in markets not previously considered by the airport during common ownership, where its business proposition was centred around functioning as a short-haul business-travel airport. New ownership has offered opportunities to develop a more diverse network serving both leisure and business markets. It had just one long-haul route in 2006. This compares to 2019, where the airport is connected to several long-haul destinations. For example, the new routes opened in 2018 included: Beijing, Dubai, Chicago and Philadelphia. However, this long-haul centred strategy has not been welcomed by all its airline customers, as the airport has been criticised by two of its short-haul regional carrier customers, Flybe and Loganair for being too focused on long-haul operations at the expense of domestic flights operated by smaller aircraft (Dalton, 2018).

6. Conclusions

In summary, it was the aim of this paper to undertake an assessment of airport competition within the Scottish Lowlands region and to examine whether competitive forces have been strengthening or weakening in recent years. Overall the analysis shows that since ownership separation, competition has intensified between Edinburgh and Glasgow, whilst Prestwick airport, which benefitted from Ryanair expansion in the 1990s, is now a significantly diminished competitive proposition in the Scottish Lowland market.

It is clear that at the beginning of the time period under consideration competition between Prestwick and Glasgow airport appeared quite strong, but the competitive forces between Glasgow and Edinburgh had been hindered by common ownership, albeit that there was still a considerable amount of route development and route churn taking place. However, it now appears that competition offered by Prestwick is quite minimal with the airport holding a very small market share. By contrast the competitive forces between Glasgow and Edinburgh seem to have been significantly strengthened, which is illustrated by not only a change in charging strategies but also by evidence suggesting that the airports are now seeking to appeal to the same markets rather than different segments, there are more shared routes, and some traffic from certain catchment areas seems to have shifted. Service quality at the two airports also appears to be improving. These findings may have implications for the development of regulatory policy. More specifically how competitive airport markets function and the

potential impact of ownership change on commercial behaviour and pricing strategy. Ownership change appears to have led to price divergence rather than lower charges which is in contrast to the expectations of policy makers when the Competition Commission concluded its examination of market power in the UK airport sector.

Limitations within this analysis need to be recognised. The datasets, particularly related to areas such as service quality, passenger characteristics and catchment areas, are incomplete or somewhat dated, and overall the time horizon under consideration is relatively short. As a result, it has not been possible to undertake a more developed econometric approach to quantitatively assess the existence of competition. Moreover, greater insight could have been gained with primary research, as well as this secondary analysis, by consulting with some of the key stakeholders involved, particularly the airport operators and airlines, in order to incorporate their interpretation of some of the evidence gathered here. In fact, a series of semi-structured interviews, with stakeholders involved – including passengers – would add to the knowledge base here and also greater understanding of the situation at Prestwick would also be very useful.

An area where no conclusions can be drawn at present is the impact of the change of ownership of Glasgow from HAH to AGS, especially as this is a relatively recent development. Hence whilst this research has made a considerable and unique contribution to understanding the competitive forces between airports within the Scottish Lowlands region, there is certainly an opportunity for further research in the future.

Acknowledgements

The authors would like to thank Mr Francois Bourienne, Director Commercial, Glasgow Airport Ltd for his very valuable insights on aeronautical charging, route development and airport competition.

References

ACI-Europe (2014), *Competition in the European Aviation Sector*, Brussels: ACI-Europe.

ACI-Europe (2017), *The Competitive Edge: Airports in Europe*, Brussels: ACI-Europe.

anna.aero (2018), Ryanair calls time on Glasgow where it is currently the third biggest airline; more than one aircraft being lost as 19 routes are poised to close, *anna.aero,* 1 March. Available at https://www.anna.aero/2018/03/01/ryanairs-glasgow-base-closure/ (accessed 10 January 2019).

Auditor General (2015), *The Scottish Government's purchase of Glasgow Prestwick Airport*, Edinburgh: Audit Scotland

Barrett, S. (2000), Airport competition in the deregulated European aviation market, *Journal of Air Transport Management*, 6(1), 13-22.

Bel, G. and Fageda, X. (2010), Privatization, regulation, and airport pricing: an empirical analysis for Europe, *Journal of Regulatory Economics*, 37, 142 – 161.

Bel, G. and Fageda, X. (2013), Market power, competition and post-privatization regulation: Evidence from changes in regulation of European airports, *Journal of Economic Policy Reform*, 16(2), 123-141.

BBC (2014), Aberdeen, Glasgow and Southampton airports sold in £1bn deal, *BBC*, 16 October. Available at https://www.bbc.co.uk/news/uk-scotland-29650438 (accessed 10 January 2019)

Bottasso, A., Bruno, M., Conti, M. and Piga, C. (2017), Competition, vertical relationship and countervailing power in the UK airport industry, *Journal of Regulatory Economics*, *52*(1), 37-62.

Bush, H. (2009), The development of competition in the UK airport market, *Journal of Airport Management*, 4(2), 114–24.

Bush, H. and Starkie, D. (2014),Competitive drivers towards improved airport/airline relationships, *Journal or Air Transport Management*, 41, 45-49.

CAA (2005*), UK Regional Air Services*, CAP 754. London: CAA.

CAA (2007), *Air Services at UK Regional Airports: An Update on Developments*, CAP 775, London: CAA.

CAA (2011), *Guidance on the Assessment of Airport Market Power*, London: CAA.

CAA (2019) *2018 Passenger Survey Report*, London: CAA.

Competition and Markets Authority (2016), *BAA airports: Evaluation of the Competition Commission's 2009 market investigation remedies*, London: CMA.

Competition Commission (2009), *BAA Airports Market Investigation*, London: Competition Commission.

Dalton, A. (2018), Flybe chief slams Edinburgh Airport's 'appalling service, *The Scotsman,* 13 October. Available at https://www.scotsman.com/news/flybe-chief-slams-edinburgh-airport-s-appalling-service-1-4814687 (accessed 10 January 2019).

De Wit, J. and Zuidberg, J. (2016), Route churn: an analysis of low-cost carrier route continuity in Europe, *Journal of Transport Geography*, 50, 57-67.

Department for Transport (2018), One giant leap: Vertical launch spaceport to bring UK into new space age, *Department for Transport*, press release 15 July. Available at https://www.gov.uk/government/news/one-giant-leap-vertical-launch-spaceport-to-bring-uk-into-new-space-age (accessed 10 January 2019).

Fichert, F. (2019), The airline-airport relationship: Allocating risks and opportunities in a vertical partnership, in Graham, A. and Dobruszkes, F. (eds) *Air Transport: A Tourism Perspective,* Oxford: Elsevier.

Forsyth, P. (2006), Airport competition: regulatory issues and policy implications, in Lee, D. (ed.), *Competition Policy and Anti-Trust*, Oxford: Elsevier.

Forsyth, P., Gillen, D., Mueller, J. and Niemeier, H.-M. (eds) (2010), *Airport Competition*, Abingdon: Routledge.

Garrow, L.(2010), *Discrete Choice Modelling and Air Travel Demand: Theory and Application*. Farnham: Ashgate.

Gillen D. and Law, A. (2004), Competitive advantage of low-cost carriers: some implications for Airports, *Journal of Airport Management*, 10(1), 41-50.

Graham, A. (2006), Competition in airports, in Papatheodorou, A. (ed.), *Corporate Rivalry and Market Power: Competition Issues in the Tourism Industry*, London: I.B. Tauris.

Graham, A. (2013), Understanding the low cost carrier and airport relationship: A critical analysis of the salient issues, *Tourism Management*, 36, 66-76.

Halpern, N. and Graham, A. (2013), *Airport Marketing*, Abingdon: Routledge.

Halpern, N., Graham, A., and Dennis, N. (2016), Low cost carriers and the changing fortunes of airports in the UK. *Research in Transportation Business and Management*, 21, 33-43.

Hess, S., Adler, T. and Polak, J.W. (2007), Modelling airport and airline choice behaviour with the use of stated preference survey data, *Transportation Research Part E: Logistics and Transportation Review*, 43(3), 221-233.

Huderek-Glapska, S. and Nowak, H. (2016), Airport and low cost carrier business relationship management as a key factor for airport continuity: the evidence from Poland, *Research in Transportation Business and Management,* 21, 44–53.

Humphreys, I. (1999), 'Privatisation and commercialisation changes in UK airport ownership patterns', *Journal of Transport Geography*, 7(2): 121–34.

Humphreys, I., Ison, S. and Francis, G. (2005), A review of the airport-low cost airline relationship, *Review of Network Economics*, 17(5), 413-420.

IATA (2013), *Airport Competition*, IATA Economics Briefing No 11, Geneva: IATA.

ICF (2016*), Evaluation of the 2009 Competition Commission's BAA airports market investigation remedies*, London: ICF.

Ison, S., Francis, G., Humphreys, I., and Page, R. (2011), UK regional airport commercialisation and privatisation: 25 years on, *Journal of Transport Geography*, *19*(6), 1341-1349.

Jankovic, O. (2018), State of the industry address. ACI Airport Exchange 2018, November, Oslo.

Jones, O., Budd, L. and Pitfield, D. (2013), Aeronautical charging policy incentive schemes for airlines at European airports, *Journal of Air Transport Management*, 33, 43-59.

Lei, Z., and Pagliari, R. (2013), Airport traffic growth and airport financial performance. in Forsyth, P., Gillen D., Hüschelrath, K., Niemeier, H.-M. and Wolf, W. (eds.), Liberalization in aviation. Abingdon: Routledge.

LeighFisher (2012), *Comparing and Capping Airport Charges*, London: LeighFisher.

Lieshout, R. (2012), Measuring the size of an airport's catchment area. *Journal of Transport Geography*, 25, 27-34.

Lieshout, R., Malighetti, P., Redondi, R., and Burghouwt, G. (2016), The competitive landscape of air transport in Europe, *Journal of Transport Geography*, 50, 68-82.

Littlechild, S. (2018), Economic regulation of privatised airports: Some lessons from UK experience. *Transportation Research Part A: Policy and Practice*, 114, 100-114.

Kim, M. H., Park, J. W., and Choi, Y. J. (2016), A study on the effect of airport choice attributes on airport users' satisfaction and behavioural intentions: The case of Gimpo international airport. *Journal of Airport Management*, *10*(2), 145-157.

Malina, R., Albers, S. and Kroll, N. (2012), Airport incentive programmes: a European perspective, *Transport Reviews*, 32(4), 435–53.

Mohammed, A. and Roisman, R. (2017), *2015 Washington-Baltimore Regional Air Passenger Survey*, Washington DC: The National Capital Region Transportation Planning Board.

OECD (2014), *Expanding Airport Capacity: Competition and Connectivity,* Paris: OECD.

Oxera (2017), *The Continuing Development of Airport Competition in Europe*, London: Oxera.

Pagliari, R., (2005), Developments in the supply of direct international air services from airports in Scotland, *Journal of Air Transport Management*, 11(4), 249-257.

Pantazis, N. and Liefner, I. (2006), The impact of low-cost carriers on catchment areas of established international airports: the case of Hanover airport, Germany, *Journal of Transport Geography*, 14(4): 265–72.

Papatheodorou, A. and Lei, Z. (2006), Leisure travel in Europe and airline business models: A study of regional airports in Great Britain', *Journal of Air Transport Management*, 12(1), 47–52.

Prentice, C., and Kadan, M. (2019), The role of airport service quality in airport and destination choice, *Journal of Retailing and Consumer Services*, 47, 40-48.

Ryerson, M.S. (2017), Incenitvize it and they will come? How some of the busiest U.S. airports are building air service with incentive programs, *Journal of American Planning Association*, 82(4), 303-315.

Socorro, M., Betancor, O. and de Rus, G., (2018), Feasibility and desirability of airport competition: The role of product substitutability and airlines' nationality. *Journal of Air Transport Management*, 67, 224-231.

Starkie D. (2008), *The Airport Industry in a Competitive Environment: A United Kingdom Perspective*, Discussion paper No 2005-15, Paris, International Transport Forum.

Starkie, D. (2012), European airports and airlines: evolving relationships and the regulatory implications, *Journal of Air Transport Management*, 21, 40–49.

Thelle, M., Pedersen, T. and Harhoff, F. (2012), *Airport Competition in Europe*, Copenhagen: Copenhagen Economics.

Thelle, M. and Sonne, M. (2018), Airport competition in Europe, *Journal of Air Transport Management*, 67, 232-240.

Van Dender, K. (2007), Determinants of fares and operating revenues at US airports, *Journal of Urban Economics*, 62(2), 317-336.

Which? (2019a), Best and worst large UK airports. Available at https://www.which.co.uk/reviews/airports/article/uk-airports/best-and-worst-large-uk-airports (accessed 12 January 2019).

Which? (2019b), Best and worst small UK airports. Available at https://www.which.co.uk/reviews/airports/article/uk-airports/best-and-worst-small-uk-airports (accessed 12 January 2019).

Wiltshire, J. (2018), Airport competition: Reality or myth? *Journal of Air Transport Management*, 67, 241-248.

https://dspace.org/

Airport competition within the Scottish lowlands region

Pagliari, Romano I.; Graham, Anne B.

2019-11-06
Elsevier
https://doi.org/10.1016/j.retrec.2019.100760
Pagliari R, Graham A. (2019) Airport competition within the Scottish lowlands region. Research in Transportation Economics, Volume 79, March 2020, Article number 100760

Downloaded from a DSpace repository. https://dspace.org/