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FINAL REPORT

COMPARING AND CAPPING AIRPORT CHARGES AT REGULATED AIRPORTS

Prepared for:

Civil Aviation Authority

Regulatory Policy Group

December 5, 2012

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1. Introduction

1.1 Purpose of this Document

This document provides the final report of a study performed by LeighFisher for the Regulatory Policy Group (RPG) of the Civil Aviation Authority (CAA) under contract 1387 Service Order 25. This study assesses the feasibility of using benchmarking for comparing and capping airport charges at regulated airports.

1.2 Study Aims

This study has been undertaken on behalf of the CAA as part of its consideration of the regulation of airports in the Q6 regulatory period. It has focused specifically on answering two overall questions:

1. Is it possible to benchmark prices at comparable airports in order to regulate charges at Gatwick and/or Stansted?
2. Is it possible to benchmark prices at comparable airports to help assess the "affordability" - or reasonableness - of the charges at Heathrow?

The first of these questions is driven by previous consideration of the market position of Stansted and Gatwick airports including the CAA's Q6 Policy Update of May 2012 which identified pegging tariffs to comparators as a potential regulatory option for those airports.

It is not intended that the comparison of prices for Heathrow explored here should be used to set a price cap for that airport, but instead to inform the CAA's work on its regulation. This intent to explore the issues is also the basis for the second of the two overall questions, relating to Heathrow's prices: it is in response to the contention of several airlines that charges at Heathrow are, or are becoming, "unaffordable".

1.3 Overall Approach

Several steps have been taken to assess the possibility of using comparisons with other airports to inform regulatory decisions, or indeed potentially to set regulatory limits on charges. In overview these are:

1. Identifying suitable criteria with which to identify similarities between airports
2. Identifying suitable comparator airports for each of the regulated airports
   - By applying those criteria to a long list of airports to construct a single index for comparisons
   - Identifying a suitable "basket" of comparators that are most similar to each of the regulated airports
3. Modelling the relative historical progression of prices for the chosen comparator airports.

Analysis has been supported by a short consultation exercise to gather the views of stakeholder airports and airlines. The CAA invited a set of airline and airport stakeholders to provide their views on the study. As a result, meetings were held with several key stakeholders:

- IATA
- The London Airlines Consultative Committee (facilitated by IATA)
- TUI airlines
- Gatwick Airport
- BAA, covering both Stansted and Heathrow
- Ryanair.

The initial feedback from these meetings was taken into account in the production of an interim presentation of results which was presented to the entire initial invited stakeholder list on 18th September 2012. The attendees at this presentation included representatives from all key stakeholders directly affected as well as other interested industry parties. The presentation and ensuing discussion in turn elicited comments from, amongst others, all three airports, which were again considered as part of the work towards producing this report.

2. Identifying Suitable Comparator Airports

2.1 Long List of Comparators

Not all airports will make suitable comparators for Gatwick, Stansted or Heathrow. The first significant task therefore was to identify which are most similar and should be included in a suitable "basket" of comparators for each of the regulated airports. This process involved the consideration of a range of factors that can be used to describe airports, and was intended to provide as comprehensive a picture as possible, given the limited availability of data.

Identifying which airports are most comparable to each of the three regulated airports began by assessing a "long list" of potential airports from across the world against a wide range of criteria that describe key airport characteristics.

This long list was drawn up on the basis of:

- Availability of data on comparator airports
- Input from stakeholders following consultation on the project
- The experience of the project team as to which are likely to be appropriate comparators
- Ensuring the inclusion of as many airports as possible that make up significant centres of operation by the principal airlines using regulated airports (i.e. British Airways, Ryanair and easyJet).

The long list covered 54 airports: 14 in the UK, 33 from the rest of Europe and 7 non-European airports. Airports in the US were excluded because of specificities of charging and operations (particularly the operation of terminals by airlines) which make comparisons of prices inappropriate.

As a result of consultation the number of airports proposed for comparison was increased to include more hubs in Asia and to ensure the coverage of UK regional airports.

UK airports (14)		Other European airports (33)				Non-European airports (7)	
O	BFS Belfast Intl	Δ	ALC Alicante		DUS Dusseldorf	AKL	Auckland Intl
	BHX Birmingham	OB	AMS Amsterdam Schiphol		FRA Frankfurt Main	BNE	Brisbane Intl
O	BRS Bristol/Lulsgate		ARN Stockholm Arlanda	Δ	HHN Frankfurt Hahn	HKG	Hong Kong
ΔOB	EDI Edinburgh		ATH Athens		HEL Helsinki - Vantaa	JNB	Johannesburg
Δ	EMA Nottingham East Midlands	ΔOB	BCN Barcelona		IST Istanbul Ataturk	MEL	Melbourne
OB	GLA Glasgow Intl	Δ	BGY Milan Bergamo		LIS Lisbon	SIN	Singapore Changi
	LBA Leeds Bradford		BRE Bremen	O	MXP Milan Malpensa	SYD	Sydney Kingsford Smith
ΔO	LPL Liverpool Intl		BRU Brussels		MUC Munich		
ΔOB	LGW London Gatwick	OB	CDG Charles De Gaulle	Δ	NRN Dusseldorf Weeze		
B	LHR London Heathrow	Δ	CIA Rome Ciampino		OSL Oslo Gardermoen		
O	LTN London Luton		CPH Copenhagen	O	ORY Paris Orly		
OB	MAN Manchester Intl	Δ	CRL Brussels S. Charleroi		PRG Prague Ruzyne		
	NCL Newcastle Intl	Δ	DUB Dublin	Δ	PSA Pisa Galileo Galilei		
ΔO	STN London Stansted	OB	FCO Rome Fiumicino	O	SXF Berlin Schoenefeld		
		OB	GVA Geneva		VIE Vienna Intl		
		Δ	GRO Girona - Costa Brava		ZRH Zurich		
		ΔO	MAD Madrid Barajas				

Δ Ryanair base (16)
O easyJet base (18)
B Top BA airports by seat capacity (10)

Figure 1: Long list of comparator airports

Consultation with stakeholders revealed that Gatwick, Heathrow and Stansted all make their own comparisons to a greater or lesser degree. Gatwick Airport provided its own list of 23 airports with which regular comparisons are made. Of these, twenty are included in the long list of comparators with the

exceptions being those that lacked sufficient revenue data to enable the chosen comparison approach (viz. Moscow Sheremetyevo, Antalya and Palma de Majorca).

Feedback from the Heathrow LACC indicated that airline users and airport alike would expect to see the major European hubs as well as other significant international hubs in Asia and the US included in the long list for Heathrow.

Since Ryanair and easyJet have significant shares of capacity at both Stansted and Gatwick and British Airways has a significant share at Gatwick and at Heathrow, a list of airports hosting significant volumes of operations by these three airlines was drawn up to ensure their markets were represented in the long list. Airports were included in this list on the basis of analysis of the distribution of their seat capacity as well as a desire to ensure a relatively wide coverage of European countries.

2.2 Assessment Criteria to Gauge Comparability

2.2.1 Approach to Choosing Criteria

Having established this long list, a set of assessment criteria was established to gauge the comparability of airports on the long list with each of Heathrow, Gatwick and Stansted.

The approach to adopting comparison criteria followed a well-established and structured way to assess the suitability of each potential criterion known as ISSR where each of the criteria for comparison is classified as **I**nherent, **S**tructural, **S**ystemic or **R**ealised. The ISSR approach facilitates the consideration of a wide range of factors for comparison and focuses the work on those factors that are relevant.

Under this approach, **Inherent and Structural** criteria are typically those that are externally driven and determined by a unique combination of factors. They are therefore more difficult to alter in the shorter term.

- **Systemic** criteria tend towards being those that are process-driven or are factors that are more readily influenced by the organisation in question.
- **Realised** criteria result from the Inherent, Structural and Systemic criteria (for example operational efficiency or factor costs) – so can often be considered to be outcomes.

Eleven Inherent and Structural criteria were investigated as illustrated in the figure below.

2.2.2 Criteria for Assessment based on the ISSR Approach

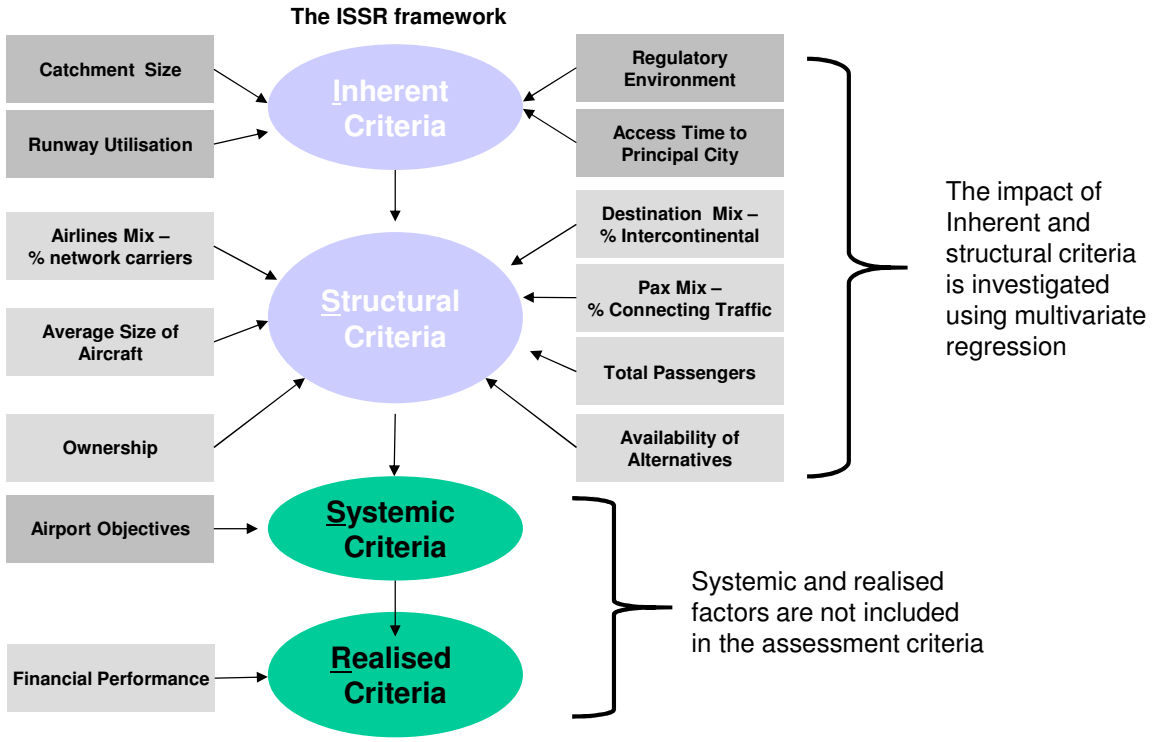

Figure 2: ISSR framework

2.3 Criteria Adopted

Data was collected for the long list of airports for each of the chosen criteria (where available) to enable the team to construct one overall quantitative index that combines the eleven diverse airport characteristics that the criteria describe.

The criteria employed are as follows:

- Inherent Criteria:
  - **Catchment Size** – the resident population of the city and region of the airport
  - **Runway Utilisation** – a generic measure of the ability of the runway system to accommodate aircraft operations including both arrivals and departures
  - **Regulatory Requirements** – a categorisation of any economic regulatory structures applied, classified as light-handed, cost-based or price cap (or not known where information was not available)
  - **Access Time to Principal City** – journey time by road to the nearest principal city.
- Structural Criteria:
  - **Mix of Airlines Served** – proportions of scheduled, low cost and charter airlines operating at the airport on the basis of seat capacity (where available); the indicator used is the proportion of network carriers

- **Mix of Destinations Served** – proportions of seat capacity available by geographic region e.g. Europe/Middle East/Asia/Americas/Australasia, with the indicator being the proportion of intercontinental traffic
- **Average Size of Aircraft** – average seat capacity per aircraft operating at the airport over the calendar year
- **Passenger Mix % Connecting Traffic** – percentage of passengers transferring onto another flight at the airport
- **Total Passengers** – passenger throughput per annum
- **Ownership** – an indicator of public, private or mixed ownership
- **Availability of Alternatives** – a measure of the extent to which there is the opportunity to substitute another nearby airport by airline operations; where another airport is present the potential for substitution is a function of the concentration of frequency (as a proxy for based aircraft) by individual airlines using analysis of frequency as a proxy for the degree of commitment to a particular airport and thus the difficulty of moving operations.

2.4 Other Potential Criteria Not Used

Having categorised the criteria and assessed the data available for each, it became clear that for the purposes of comparing price, those criteria falling into the Systemic and Realised Criteria categories should not be used. While Systemic criteria, such as an airport's strategy or objective may vary for a range of reasons, and ultimately have a direct influence on the prices, they cannot be made subject to objective comparison. Similarly, realised criteria such as financial performance of airports may be a function of price, but as with the airport objective criteria are subject to choice of airport behaviour in the market rather than being an indicator of price on objective factors.

The choice of criteria took account of stakeholder feedback but did not necessarily adopt every suggestion. For example, a suggestion that criteria should take account of the different markets in which airports operate was recognised as important but is reflected in the use of several factors, including mix of destinations served and the passenger mix criteria, rather than creating one definition for the nature of the market.

2.4.1 Service Quality

Stakeholder feedback from Stansted and Gatwick in particular but also Heathrow advocated the inclusion of service quality as a significant criterion, arguing that the provision of service standards is part of an overall package of facilities, service and price with which they compete, or that higher quality standards will justify higher prices. However, despite these stakeholder recommendations, service quality has not been included on the basis that it is the match of service quality to the customer's requirements that is more properly assessed rather than the absolute comparison between different service levels delivered in potentially different market segments.

While a secondary consideration, the absence of publicly available data on comparable service standards for the vast majority of airports on the long list would also have prevented its inclusion. (There is a lack of publicly available data for service quality at airports beyond the service quality requirements that the CAA operates as part of the current regulatory regime. Several comparator airports participate in the ACI Airport Service Quality passenger satisfaction survey but the results of this are confidential.)

2.4.2 Input Costs

In response to the draft findings of the study several stakeholders argued that price comparisons should take account of input costs. These have not been included for the following reasons:

- one of the aims of the study is to compare *prices* across airports to establish whether this could be used to regulate charges at Gatwick and Stansted, so including input costs in the choice of benchmarks effectively goes against this consideration (one of the key advantages in regulating using benchmarked charges is that it avoids the cost and complexity of a detailed consideration of input costs)
- the inclusion of such input costs could risk creating a circular argument whereby inefficient inputs costs drive and justify higher prices.

2.4.3 Investment Cycle

Some stakeholders also advocated the inclusion of criteria that would identify the point in the investment cycle at which airports' prices are compared on the basis that, at any given time, prices would reflect investment in new infrastructure required.

This has not been adopted for four reasons:

- data for such a metric is unavailable for the long list airports, and the potential for many and varied different approaches to investment (e.g. the approach to procurement, capital efficiency, the range of different types of infrastructure being constructed, the cost of capital available to different organisations) make building a quantitative metric impossible
- as with similar systemic criteria it is, again, the match to customers' requirements that is important not an absolute comparison that we consider to be appropriate
- one might expect the investment cycle not to directly impact on airport charges in any one year, for example we would expect costs and the impact on charges to be spread over time, reducing the scale of impact of any investment cycle
- the aim is to compare prices not costs.

2.4.4 Other Systemic Criteria

Systemic criteria originally proposed but considered and rejected included Airport Objectives. Consideration was given to different airport objectives related to service offering, fixed assets per passenger, aspirations for growth, profitability or strategies affecting regional economic development.

The study recognises that some of these factors, such as a case where a regional government provides an airport with subsidies, may have a significant impact on the price that is ultimately offered to an airline in commercial negotiations. We have therefore explored the possibility of identifying this and other forms of discounting where they are not explicitly set out in the tariff. Although in some cases the existence of discounting may be identifiable by comparing the published tariffs and the revenue per passenger, this is not the case if the discount is reflected somehow in the published tariff nor if reliable revenue figures are not available.

There is, therefore, a difficulty of data not least due to the fact that (as several stakeholders have pointed out) agreements between airports and airlines are commercially confidential. There are other factors that may have a similar result in terms of price due to airport objectives, such as an airport pursuing a strategy for rapid market share growth based on price reductions for which there is, equally, no reliable or publicly available data.

However, the study team has taken the view that the data is a secondary issue since discounts and subsidies are, as with customer service and the investment cycle, also the result of airports seeking to match customer requirements against a product or service offered and not therefore appropriate for use as a criterion for comparison of prices.

2.4.5 Regulatory Environment

It may be expected that the regulatory environment under which the airports operate has an impact on how prices are determined and, ultimately, the level at which they are set. Therefore, regulatory structure has been taken into consideration in the analysis by classifying each airport into three regulatory categories, as illustrated in Figure 3.

Airport		Regulatory Structure
Alicante	ALC	Cost based
Amsterdam Schiphol	AMS	Price cap
Athens	ATH	Price cap
Auckland Intl	AKL	Light handed
Barcelona	BCN	Cost based
Belfast Intl	BFS	Light handed
Berlin Schoenefeld	SXF	Cost based
Bremen	BRE	Cost based
Brisbane Intl	BNE	Light handed
Bristol/Lulsgate	BRS	Light handed
Brussels	BRU	Price cap
Brussels S. Charleroi	CRL	Cost based
Charles De Gaulle	CDG	Price cap
Copenhagen	CPH	Price cap
Dublin	DUB	Price cap
Dusseldorf	DUS	Cost based
Frankfurt Main	FRA	Cost based
Frankfurt Hahn	HHN	Cost based
Geneva	GVA	Cost based
Girona - Costa Brava	GRO	Cost based
Glasgow Intl	GLA	Light handed
Helsinki - Vantaa	HEL	Cost based
Hong Kong	HKG	Cost based
Istanbul Ataturk	IST	Cost based
Johannesburg	JNB	Price cap
Leeds Bradford	LBA	Light handed

Airport		Regulatory Structure
Lisbon	LIS	Cost based
Liverpool Intl	LPL	Light handed
London Gatwick	LGW	Price cap
London Heathrow	LHR	Price cap
London Luton	LTN	Light handed
London Stansted	STN	Price cap
Madrid Barajas	MAD	Cost based
Manchester Intl	MAN	Light handed
Melbourne	MEL	Light handed
Milan Malpensa	MXP	Price cap
Munich	MUC	Cost based
Oslo Gardermoen	OSL	Cost based
Paris Orly	ORY	Price cap
Prague Ruzyne	PRG	-
Rome Ciampino	CIA	Price cap
Rome Fiumicino	FCO	Price cap
Singapore Changi	SIN	Price cap
Stockholm Arlanda	ARN	Cost based
Sydney Kingsford Smith	SYD	Light handed
Vienna Intl	VIE	Price cap
Zurich	ZRH	-
Milan Bergamo	BGY	Cost based
Edinburgh	EDI	Light handed
Pisa Galileo Galilei	PSA	Cost based
Dusseldorf Weeze	NRN	-
Nottingham East Midlands	EMA	Light handed
Newcastle Intl	NCL	Light handed

Price cap	Incentive based approach; prices are allowed to increase up to a cap that represents an acceptable profit margin.
Cost based	Cost based approach; prices are set according to principles of cost relatedness.
Light handed	Regulation is not intrusive, allows airport discretion in how it meets regulatory targets.

Figure 3: Summary of regulatory provisions at the comparator airports

The impact of the type of regulation on the level of charges has been tested using multivariate regression analysis as reported in Section 2.5 below. The outcome of the analysis is that airports that are subject to price cap regulation have a price that is approximately £2.60 higher than airports operating in other regulatory environments, all other things being equal. This could reflect a number of factors, for example the degree of competition or market power enjoyed by price capped airports that are operating as scarce resources, the control exerted by regulators being less effective than competition and distortions created by the price cap, for example on investment incentives. There may well be other factors not included in the multivariate regression and correlations between factors, for example there are strong correlations between the price cap variable and the proportion of intercontinental traffic at the airport, the size of the airport and the unavailability of alternatives.

2.5 Assessing the Impact of the Criteria

The importance or relevance of the long list of selection criteria as drivers of difference for airport charges has been tested using multivariate regression analysis (changing, from the original more simple bivariate correlation analysis relating aeronautical revenue to individual criteria as a result of stakeholder feedback). The criteria were used as independent variables and the aeronautical revenue per passenger (see Section 3) was used as the dependent variable for all of the airports where a complete data set was available. This data set was restricted to calendar year 2010. Where criteria are not easily quantified, e.g. the type of regulation or ownership profile, they were included in the regression as binary variables (0 or 1). The data set is summarised in Figure 4 below.

				Type of regulation											Ownership profile			
Airport	Catchment size (M)	Aero revenue per pax	Runway utilisation	Price cap	Cost based	Light handed	Journey time from main conurbation	Proportion of network carriers	Proportion of inter-continental traffic	Average seats per aircraft	Percentage of short haul	Proportion of connecting traffic	MPPA	Public	Corporatised	Mixed	(Un) availability of alternatives
AMS	8.0	12.29	0.572	1	0	0	20.0	0.829	0.363	158.2	0.565	0.435	49755	0	0	1	2.26
ATH	3.5	14.00	0.311	1	0	0	32.0	0.944	0.104	138.5	0.684	0.139	14428	0	0	1	1.72
AKL	1.5	6.75	0.262	0	0	1	28.0	0.770	0.260	133.1	0.412	0.230	14020	0	0	1	1.54
BFS	1.6	3.69	0.126	0	0	1	30.0	0.270	0.022	158.2	0.835	0.016	4123	0	0	0	0.52
BNE	2.2	6.38	0.683	0	0	1	30.0	0.572	0.149	152.9	0.687	0.001	20449	0	0	0	2.13
BRS	2.4	4.42	0.210	0	0	1	18.0	0.149	0.005	126.5	0.917	0.004	5781	0	0	0	0.88
BRU	5.0	12.41	0.420	1	0	0	20.0	0.869	0.273	133.2	0.664	0.205	18756	0	0	1	1.48
CDG	10.0	14.78	0.477	1	0	0	30.0	0.898	0.423	161.7	0.543	0.346	60971	0	0	1	1.98
CPH	2.6	9.34	0.503	1	0	0	15.0	0.792	0.071	117.5	0.837	0.247	22673	0	0	1	1.80
DUB	1.9	8.06	0.299	1	0	0	15.0	0.573	0.106	164.3	0.792	0.101	18716	0	1	0	1.20
FRA	5.8	6.56	0.627	0	1	0	25.0	0.922	0.400	175.1	0.551	0.550	56436	0	0	1	2.51
GVA	2.0	9.01	0.502	0	1	0	17.0	0.669	0.135	137.3	0.837	0.061	13023	1	0	0	1.43
GLA	2.7	6.55	0.267	0	0	1	15.0	0.410	0.105	113.6	0.803	0.016	6883	0	0	0	0.84
HKG	7.1	6.07	0.523	0	0	0	50.0	0.958	0.232	257.6	0.429	0.310	53329	1	0	0	1.79
LBA	5.9	2.72	0.148	0	0	1	18.0	0.158	0.011	117.3	0.752	0.042	3020	0	0	0	0.73
LPL	6.9	2.17	0.186	0	0	1	20.0	0.031	0.000	154.4	0.896	0.001	5251	0	0	1	0.57
LGW	6.9	7.96	0.904	1	0	0	60.0	0.372	0.174	157.3	0.711	0.076	33681	0	0	0	1.57
LHR	8.9	15.59	0.986	1	0	0	75.0	0.996	0.537	196.0	0.177	0.313	69434	0	0	0	2.01
LTN	5.5	5.05	0.256	0	0	1	70.0	0.015	0.032	166.3	0.825	0.007	9519	0	0	0	0.78
STN	5.5	6.82	0.480	1	0	0	50.0	0.007	0.011	164.9	0.923	0.000	18047	0	0	0	1.14
MAD	7.0	5.36	0.837	0	1	0	30.0	0.639	0.222	157.8	0.740	0.317	49645	0	1	0	2.34
MAN	15.0	7.65	0.280	0	0	1	19.0	0.520	0.217	144.8	0.629	0.046	18988	1	0	0	1.04
MEL	4.2	5.62	0.782	0	0	1	35.0	0.559	0.236	181.3	0.622	0.114	28061	0	0	0	2.15
OSL	3.5	9.18	0.439	0	1	0	39.0	0.598	0.041	128.4	0.909	0.169	21103	0	1	0	1.47
SIN	5.2	6.36	0.495	1	0	0	20.0	0.786	0.267	225.7	0.351	0.297	46544	0	1	0	1.93
ARN	2.1	8.34	0.445	0	1	0	33.0	0.761	0.093	120.6	0.842	0.148	19088	0	1	0	1.44
SYD	5.0	8.60	0.611	0	0	1	19.0	0.656	0.286	168.0	0.537	0.206	36017	0	0	0	2.02
VIE	7.5	11.75	0.486	1	0	0	16.0	0.775	0.124	126.4	0.851	0.330	21106	0	0	1	1.81
ZRH	5.0	16.36	0.494	0	0	0	17.0	0.852	0.229	136.6	0.728	0.380	24284	0	0	1	1.85
EDI	3.0	6.55	0.423	0	0	1	25.0	0.359	0.028	121.5	0.886	0.005	9386	0	0	0	1.14
EMA	5.0	4.61	0.076	0	0	1	25.0	0.032	0.011	148.7	0.865	0.001	4260	0	0	0	0.78
NCL	3.0	5.32	0.087	0	0	1	12.0	0.392	0.053	112.1	0.785	0.007	4346	0	0	1	0.46
BHX	5.5	6.13	0.310	0	0	1	20.0	0.376	0.099	125.4	0.788	0.024	8622	0	0	1	0.79

Figure 4: Data used for multivariate regression

Initial regression analysis using all of the independent variables indicates that some are significant drivers and others are not. The overall results are shown in Figure 5.

Regression Statistics	
Multiple R	0.880369719
R Square	0.775050843
Adjusted R Square	0.657220332
Standard Error	2.124362678
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	326.5295149	29.68450135	6.577675316	0.000117893
Residual	21	94.77125253	4.512916787		
Total	32	421.3007674			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	5.475529738	3.112581711	1.759160159	0.093113808	-0.997438281	11.94849776	-0.997438281	11.94849776
Catchment	0.212792661	0.155622996	1.367360002	0.185970735	-0.110843077	0.536428398	-0.110843077	0.536428398
Runway utilisation	-0.218630064	4.366285724	-0.050072322	0.960537964	-9.298818307	8.861558178	-9.298818307	8.861558178
Price Cap?	2.580570492	0.885253608	2.915063513	0.008277248	0.739584833	4.421556151	0.739584833	4.421556151
Journey Time by Car	0.055734143	0.035504513	1.569776307	0.131413163	-0.018101533	0.129569819	-0.018101533	0.129569819
Network Carriers	9.476147076	3.373213873	2.809233993	0.010509694	2.461164806	16.49112935	2.461164806	16.49112935
Intercontinental	3.358202822	7.443507847	0.451158633	0.656499536	-12.12141915	18.83782479	-12.12141915	18.83782479
Avrg. Seat capacity per aircraft	-0.04012621	0.019235498	-2.086049949	0.049356901	-0.080128618	-0.000123802	-0.080128618	-0.000123802
Transfer %	2.983918657	6.684490701	0.446394316	0.859881541	-10.91724075	16.88507807	-10.91724075	16.88507807
Airport Size ('000)	-5.51521E-05	7.73865E-05	-0.71268349	0.783886002	-0.000216086	0.000105782	-0.000216086	0.000105782
Private ownership	1.091388977	1.299464174	0.839876157	0.410438167	-1.610994709	3.793772664	-1.610994709	3.793772664
(Un)availability of Alternatives	-0.272653899	2.044430691	-0.133364217	0.895175096	-4.524280268	3.97897247	-4.524280268	3.97897247

Figure 5: Outcome of multivariate regression

In summary, the regression analysis shows that:

- some criteria appear, somewhat surprisingly, to be not significant (coded red in the figure): these being runway utilisation, the proportion of intercontinental traffic, the proportion of connecting traffic, the overall volume of traffic (MPPA) and the unavailability of alternatives. This may be due to the criteria actually not being of great influence or a manifestation of regression with 12 independent variables and only 33 data points
- some coefficients for significant variables appear counter-intuitive:
  - as runway utilisation increases, aeronautical revenue per passenger decreases, presumably reflecting economies of scale
  - as the size of aircraft increases, aeronautical revenue per passenger decreases, again perhaps because of economies of scale.

From these results it can be inferred that:

- price cap regulation appears to elevate the revenue per passenger by approximately £2.60 compared to the other categories of regulation. There are several potential explanations for this as discussed in Section 2.4.5
- aeronautical revenue per passenger increases at a rate of approximately £0.05 per minute of increased journey time from the main conurbation. The likely reason of this is not clear
- aeronautical revenue per passenger increases by approximately £0.90 for every 10% increase in the proportion of network carriers (consistent with a general expectation that intercontinental operations would usually imply larger aircraft, and longer turn-around periods incurring greater levels of service and therefore higher price – which they may be able to bear more easily considering higher long haul fares – compared to short haul and domestic)

- aeronautical revenue per passenger increases by approximately £0.33 for every 10% increase in the proportion of intercontinental traffic (consistent with a general expectation that intercontinental operations would usually imply larger aircraft as above)
- aeronautical revenue per passenger decreases by approximately ~£0.40 for every 10 seat increase in the average aircraft size; this is probably an economy of scale effect
- aeronautical revenue per passenger increases by ~£0.30 for every 10% increase in the proportion of transfer traffic, reflecting the greater handling required for transfer traffic and baggage than simple point-to-point traffic
- aeronautical revenue per passenger decreases slightly with increasing traffic, probably reflecting economies of scale.

In addition, this type of regression analysis could be used as a basis for assessing the charges levied by a particular airport with the expectation value for that airport, where the expectation value is derived from the results of the regression. This would require, however, data describing the criteria to be available over several years so that time series could be constructed. This large amount of data was not available during this study and, hence, the regression was restricted to calendar year 2010. It would also require interdependencies (co-linearity) between the dependent variables to be understood. Finally, the number of airports for which reliable data is available compared to the number of degrees of freedom in the regression is relatively low: statistically this necessarily results in large error bars and low levels of confidence.

2.6 Constructing Comparability Index

To identify which airports are the most appropriate comparators for Heathrow, Gatwick and Stansted, the scores against the individual selection criteria have been combined into a single index of comparability. The index is based on scoring each airport against the selection criteria, as appropriately weighted. The process for determining rankings is described in the sections below.

2.6.1 Assessment Criteria

Although all the criteria that describe airport characteristics have been included because they are relevant to identifying suitable comparators it should not be expected that each would be of equal value. Weightings have been derived from the multivariate regression analysis to reflect the degree of significance that each of the criteria is likely to have on the drivers for the differences between charges at airports. The weightings have been derived from the confidence levels (effectively 1-P-value from the regression results above). These weightings are summarized in the table below. This approach to weighting is used to reflect the confidence that the criteria influence the aeronautical revenue per passenger, as a proxy for price. The coefficients themselves have not been used as weights because the elasticity (or relative force with which each criterion drives the aeronautical revenue per passenger) is accounted for through the difference scores as described in Section 2.6.2. Price cap regulation has not been included in the criteria as this would have the perverse effect of biasing the benchmarking to the other price capped airports, whereas the objective of the study was, where feasible, to benchmark against a proxy for the market or competitive price.

Parameter	Weighting
Catchment	0.8
Runway utilisation	0.1
Journey time	0.9
Network carriers	1.0
Intercontinental	0.3
Avrg. seat capacity per aircraft	1.0
Transfer %	0.2
Annual passengers	0.1
(Un)availability of alternatives	0.1

Thus, the degree of presence of network carriers, aircraft size, journey time to the airport and size of catchment are of greatest significance, although all are included.

2.6.2 Calculating Airport Comparability Ranking

Each airport was scored against each criterion, with the weightings above applied, to generate a ranking of each of the comparator airports according to their difference from each of Gatwick, Stansted and Heathrow.

The process followed is set out in the figure below.

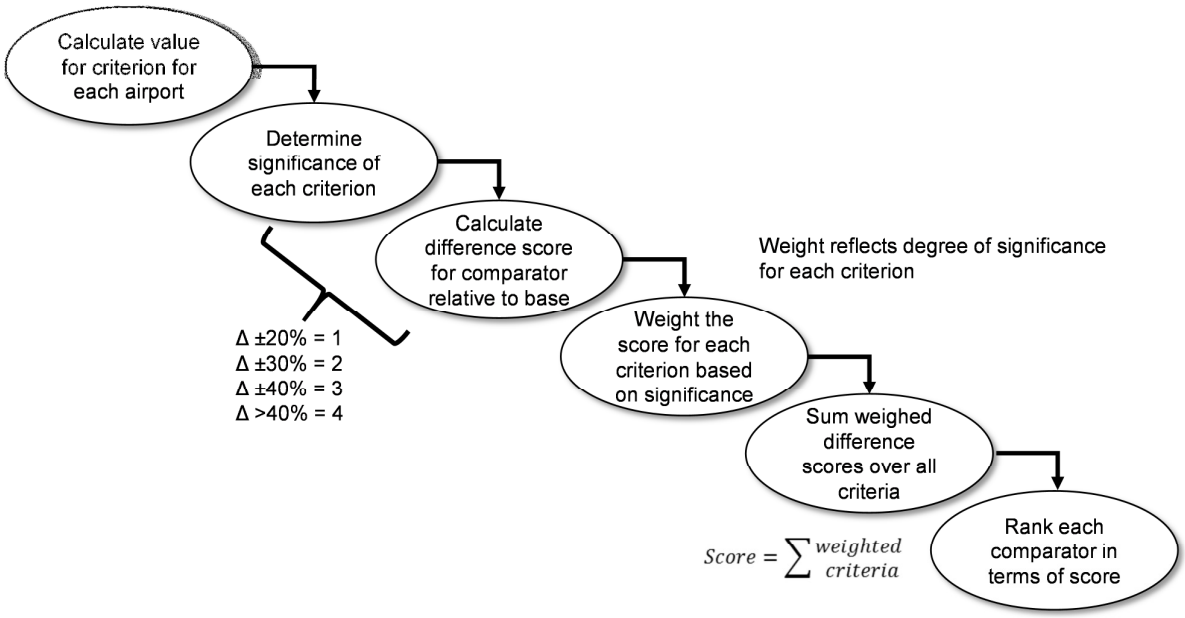

Figure 6: Process for ranking comparators

The differences windows were defined as less than 20%, between 20% and 30%, between 30% and 40% and greater than 40% as these windows were found to give a reasonable spread, rather than the results showing all airports being bunched in a single window.

With the weightings applied as described above, the total scores can be summed to provide a ranking. Those airports that rank most closely related to each of the three airports being benchmarked can be included in the basket for price comparison.

2.6.3 Qualifying Range for Each Basket

In order to provide baskets of airports for comparison that provide a reasonable number of airports and to ensure consistency in the process, the qualifying limit – or cut-off point – has been based on the variance of difference rather than the absolute score.

Following feedback on the initial results, the cut-off range was extended so that airports for which the score is within 2.5 times that of the comparator airport have been included in each basket. This cut-off is applied consistently for each of the three airports being investigated. This provides a reasonable sample size but excludes comparators that are wildly different. Thus for the nine criteria with the weighting scheme used, the score for Gatwick, Heathrow and Stansted themselves is 4.6 and the comparator cut-off is made at 11.4.

2.7 Gatwick Comparators

Applying the selection process set out above, there are 13 airports in Gatwick's comparator group.

Score	Airport	
8.3	Birmingham	
9.5	London Stansted	ΔO
9.8	London Luton	O
10.1	Madrid Barajas	ΔO
10.4	London Heathrow	ΔOB
10.4	Edinburgh	B
10.5	Barcelona	Δ
10.6	Brussels S. Charleroi	Δ
10.7	Newcastle Intl	
10.7	Vienna Intl	
11.1	Milan Malpensa	O
11.2	Hong Kong	
11.3	Melbourne	
11.7	Rome Fiumicino	
11.8	Leeds Bradford	
11.9	Glasgow Intl	
12.0	Brisbane Intl	
12.1	East Midlands	
12.2	Belfast Intl	
12.3	Manchester Intl	

Score	Airport
12.6	Munich
12.6	Oslo Gardermoen
12.6	Zurich
12.7	Amsterdam Schiphol
12.7	Frankfurt Main
12.7	Pisa Galileo Galilei
12.8	Liverpool Intl
12.8	Stockholm Arlanda
12.8	Sydney Kingsford Smith
13.2	Bremen
13.2	Brussels
13.3	Helsinki - Vantaa
13.5	Dublin
13.6	Rome Ciampino
13.6	Dusseldorf
13.6	Girona - Costa Brava
13.7	Dusseldorf Weeze
13.9	Athens
13.9	Geneva
13.9	Lisbon

Score	Airport
14.0	Charles De Gaulle
14.0	Paris Orly
14.2	Singapore Changi
14.3	Istanbul Ataturk
14.4	Berlin Schoenefeld
14.6	Copenhagen
14.8	Johannesburg
14.9	Auckland Intl
14.9	Prague Ruzyne
15.0	Alicante
15.2	Bristol/Lulsgate
15.2	Milan Bergamo
15.2	Frankfurt Hahn

Δ Principal Ryanair airport by seat capacity
O Principal easyJet airport by seat capacity
B Principal BA airports by seat capacity

Selected for comparison

Figure 7: Comparator basket for Gatwick

The selected comparators include airports hosting the major Ryanair, easyJet and BA services considered in the long list.[1]

1 *Note that other airports in the table besides those indicated as such may also be Ryanair and easyJet bases but were not necessarily in the original list drawn up, or have less seat capacity than the key bases.*

2.8 Stansted Comparators

For Stansted there are 19 airports within the cut-off.

Score	Airport	
6.1	London Luton	Δ
6.2	Brussels S. Charleroi	O
6.9	East Midlands	
9.1	Berlin Schoenefeld	O
9.3	Girona - Costa Brava	Δ
9.3	Leeds Bradford	
9.3	Rome Ciampino	Δ
10.0	London Gatwick	O
10.1	Liverpool Intl	ΔO
10.2	Dusseldorf Weeze	
10.3	Pisa Galileo Galilei	Δ
10.6	Birmingham	
10.9	Frankfurt Hahn	Δ
10.9	Milan Malpensa	O
11.1	Barcelona	ΔOB
11.2	Oslo Gardermoen	
11.3	Hong Kong	
11.3	Melbourne	
11.4	Rome Fiumicino	
11.5	Alicante	

Score	Airport
11.5	Milan Bergamo
11.7	Brussels
12.3	Zurich
12.4	Sydney
12.5	Johannesburg
12.5	Madrid Barajas
12.5	Munich
12.5	Vienna Intl
12.5	Athens
12.5	Bristol/Lulsgate
12.6	Frankfurt Main
12.7	Belfast Intl
13.0	Edinburgh
13.0	Stockholm Arlanda
13.0	Brisbane Intl
13.2	Helsinki - Vantaa
13.4	Singapore Changi
13.9	Charles De Gaulle
13.9	Manchester Intl
14.0	Dusseldorf

Score	Airport
14.0	Dublin
14.1	Geneva
14.1	Lisbon
14.2	Newcastle Intl
14.3	Auckland Intl
14.4	Copenhagen
14.5	Paris Orly
14.5	Prague Ruzyne
14.7	Bremen
14.9	Istanbul Ataturk
15.0	Amsterdam Schiphol
15.0	London Heathrow
15.5	Glasgow Intl

Δ Principal Ryanairport by seat capacity
O Principal easyJet airport by seat capacity
B Principal BA airports by seat capacity

Figure 8: Comparator basket for Stansted

2.9 Heathrow Comparators

For Heathrow there are just seven qualifying airports that appear to be suitable comparators in the long list.

Score	Airport
8.7	Charles De Gaulle
9.5	Milan Malpensa
9.6	Amsterdam Schiphol
10.0	Istanbul Ataturk
10.6	Hong Kong
10.9	Frankfurt Main
11.1	London Gatwick
12.4	Rome Fiumicino
12.4	Singapore Changi
12.5	Paris Orly
12.6	Madrid Barajas
12.6	Milan Bergamo
13.0	Brussels S. Charleroi
13.0	Vienna Intl
13.1	East Midlands
13.2	London Luton
13.2	London Stansted
13.4	Lisbon
13.5	Athens
13.5	Dusseldorf Weeze

Score	Airport
13.5	Melbourne
13.5	Sydney Kingsford Smith
14.2	Girona - Costa Brava
14.4	Zurich
14.5	Helsinki - Vantaa
14.5	Johannesburg
14.5	Munich
14.5	Pisa Galileo Galilei
14.6	Brussels
14.6	Oslo Gardermoen
14.7	Geneva
14.9	Dublin
15.0	Frankfurt Hahn
15.0	Rome Ciampino
15.4	Copenhagen
15.4	Liverpool Intl
15.5	Auckland Intl
15.6	Birmingham
15.7	Brisbane Intl
15.7	Prague Ruzyne

Score	Airport
15.9	Barcelona
15.9	Belfast Intl
15.9	Manchester Intl
16.0	Alicante
16.5	Edinburgh
16.5	Newcastle Intl
16.6	Stockholm Arlanda
16.7	Dusseldorf
16.9	Glasgow Intl
17.0	Berlin Schoenefeld
17.0	Bremen
17.1	Leeds Bradford
18.0	Bristol/Lulsgate

Selected for comparison

Figure 9: Comparator basket for Heathrow

2.10 Exclusions Due to Lack of Revenue Data

The process described so far has provided a reasonable number of comparators for each airport. However the identification of price comparisons depends on the availability of reliable revenue data for the comparator airports. Unfortunately, the lack of such data excludes several comparators from the potential baskets.

Of Gatwick airport's closest comparators, over two thirds have suitable revenue data with which comparisons can be made: Brussels Charleroi and Milan Malpensa have been excluded since no reliable time series revenue data is available. Although no individual revenue data is available for Barcelona or Madrid, the average for AENA as a whole is presented in the results given below.

For Stansted, data is available for just under 50% (nine of the 19) of the closest comparators, so that 10 are excluded from the comparison basket.

Data is not available for two of the comparators in Heathrow's basket, Milan Malpensa and Istanbul Ataturk. In the case of Charles de Gaulle, data is only available at a group level and the results are presented below for Aéroports de Paris (ADP) as a whole, of which Charles de Gaulle makes up 70% of its business[2]. Similarly, data for the Fraport group has been used as a proxy for Frankfurt am Main, another of Heathrow's comparators, since it also makes up a majority of the group and individual airport data is also not available[3].

2 *By passenger volume*

3 *Frankfurt represents 56% of Fraport passenger volumes (with Antalyamaking up the next largest proportion)*

3. Generating Price Indices For Comparison

3.1 Approach to Modelling Prices

The preceding pages have identified the comparators for airport prices. A database of airport charge information both present and historical has been used to identify the historic profile of charges for the basket of airports selected as suitable comparators and compared with changes in charges at Gatwick, Stansted and Heathrow airports.

The relative prices for airports in each basket have been modelled using two overall approaches to comparing prices:

1. based on published airport tariffs to construct a representative tariff that is then applied to example aircraft types and weighted for the pattern of operations at each airport. This is then corrected for currency differences and inflation, and indices of price per aircraft and per passenger are built.

2. based on reported actual aeronautical revenue data using published sources of aeronautical (and also total) revenue to construct a price per passenger index.

Each of these approaches is described in more detail below.

3.1.1 Correcting for Currency and Inflation

The comparators with Heathrow and Gatwick are drawn from different world regions and Stansted's from ten different European countries, so in analysing the historical progression of charges it is necessary to correct prices for both currency and inflation for either of the two approaches.

Three possible methods have been tested:

1. to convert at the exchange rate of the day to the common currency (GB Pounds) and correct for inflation using UK inflation figures

2. to correct for inflation using the own-country inflation data, and convert at an exchange rate for a fixed time (we have chosen 2011 as the base year for inflation and currency conversion in all cases)

3. to use Purchasing Power Parity (PPP) exchange rates to reflect the impact of price at the national level, in which case the logical approach is to use exchange rates of the day and adjust for inflation using UK inflation figures. However, PPP would not reflect, for example, the regional variation within a country that has been raised as a reason for prices being high for London airports, for example.

Of the first two of these possibilities, the second is preferable because otherwise the results are affected by any persistent drift or variation in the GBP exchange rate against other currencies. Changes in charges in other countries are best assessed in relation to own-country inflation rates. This means that the outcome will be affected by the particular date at which one sets the exchange rates. Thus the resulting index is more relevant in relation to changes than its absolute value. Setting an absolute value for a particular starting year might be done in a different way, for example using PPP rates.

The exchange rates, employed here, where possible, are whole year average rates rather than point rates. We have used OECD data to provide as far as possible a consistent data source and have drawn on other sources (such as Eurostat for a forecast of 2012 average exchange rates) where necessary.

PPP rates are more difficult to use, and in general there is a delay in their availability: 2010 was the latest available date in consistent sources. GDP-based PPP rates have been employed as they provided the broadest consistent data set (from OECD) for GDP-weighted PPP rates. However, gaps in the data

required a variety of other sources to be used and in general we believe PPP rates will be too troublesome and ill-defined for long term use. Although they could potentially be considered as a useful way to establish a starting point from which subsequent changes might be measured in future analysis, they have not been employed in this study.

Having tested these three methods we have chosen to correct for inflation and currency using own-country inflation data (with 2011 as base year) for each airport, converted to £GB at the 2011 exchange rate (for the reasons given above).

3.1.2 Correcting for Other factors

In the aeronautical revenue per passenger approach, revenues due to pure cargo flights have been estimated and subtracted. This has been done by calculating the revenue from landing charges that would be generated by the proportion of pure cargo movements at the airport based on published tariffs and an estimation of the average size of the cargo aircraft operating at the airport. For most airports, the aeronautical revenue due to pure cargo movements is relatively small, typically 1% to 2% of total aeronautical revenue. The main exceptions, with high cargo revenue, are East Midlands and Hong Kong.

Air traffic control (ATC) charges are a further complication. In non-UK cases, ATC charges are collected directly by the ATC provider, invisible to the airport. In those UK airports with contracts with NATS, the charges are collected by the airport and effectively passed on to NATS according to the terms of the contract (which is commercially sensitive). In the case of the main London airports, where charges were originally collected by NATS, terminal navigation charges at Gatwick, Heathrow and Stansted have since 2008 been collected by the airport as revenue and passed through to NATS as an operating cost. In addition, some UK airports are self-providers of ATC and the associated revenue will therefore appear as aeronautical revenue. To correct for this, the ATC charges for Heathrow, Gatwick and Stansted (which are known) have been subtracted from aeronautical revenue to facilitate comparability with non-UK airports where air traffic control (ATC) revenue is collected separately from the airport. In addition, an approximation for the ATC revenue at the other UK airports has been made by taking an average per passenger figure derived from a sample of available data. This likely introduces a random error in the aeronautical revenue per passenger for the other UK airports that will be an underestimate in some cases and an overestimate in others.

3.2 Comparing Published Tariffs

3.2.1 Nature of Published Tariffs

Published tariffs are available for all airports and therefore provide one way to compare prices. The key disadvantage with this approach is that actual charges may be discounted from the published tariffs. At many airports, the advertised tariff bears little resemblance to what its major airline customers are paying (as only in unusual circumstances such as for a diverted flight would an airline pay the tariff). On the other hand, airports with greater market power will seek to achieve their advertised tariff. While the study recognises that at these airports airlines may also receive discounts, for example in the form of marketing support for new routes, that do not form part of published tariffs, the extent of such support is not understood to be so extensive that it would introduce significant biases to the results.

Only those airports that mainly assert their published tariff to their main customers have been included in this analysis. At airports without market power the tariff bears so little relation to price that they would not provide a reasonable picture of the price and would invalidate the analysis. This effectively means that the regulated airports – by definition those with market power – are compared only with others with market power when comparing published tariffs.

Tariffs are also typically complex and often applied to a range of airport services which can further disguise the actual charges levied. Even employing the extensive database that LeighFisher has built up over many years, it is sometimes the case that only partially complete data is available. Reviews of airport tariffs can provide, at the very least, a useful management tool for the industry and by applying approximate calculation methods to combine available information on the different parts that make up any given tariff, approximate indicators of the level of the tariffs can be computed. However, it is not possible to recalculate exactly what the charge is for each aircraft using the airport to the degree of certainty required for regulatory purposes.

3.2.2 Calculating Representative Charges for Different Aircraft Types

To construct an index of prices based on published tariffs we have used the tariff applying on 1 July 2012 (to simplify what would otherwise be a very complex process to identify each element and rebuild it over the years of this analysis) at each airports and constructed an average charge for six representative different aircraft types. These are designed to cover a wide range of capacities and thus types of service and airline operators as follows:

- ATR72
- Airbus 319
- Airbus 320-200
- Boeing 737-800
- Boeing 747-400
- Boeing 767-300.

The representative average charge for each aircraft is constructed by applying typical average parameters for airport charges including:

- aircraft tonnage
- passenger loading
- period of parking
- domestic/international proportions
- seasonal factors.

The resulting representative charge is described in two ways:

A. As a total charge per aircraft (including its passengers)

B. As an average (total) charge per passenger on that type of aircraft.

These data are separated into six classes (by seating capacity) for each of the six representative aircraft types and the proportions of frequency and capacity in those six classes computed (this was done for three years in the time series and interpolated for the remainder of the time period due to the complexities of gathering tariff data for each year).

Two tariff baskets were then constructed for each airport, one weighting the aircraft based charge (A) with frequency weights (that is the number of air transport movements at each airport per year) and the other weighting the per passenger charge (B) with capacity weights, i.e. the number of seats flown from each airport per year (capacity being used as the best proxy available for actual passengers by type of aircraft). The relative weights of each aircraft type for each airport for 2010 are indicated in Figure 10 below.

Airport		Aircraft seat capacity					
		>300	220-299	170-219	140-169	100-139	<100
Alicante	ALC	0.00	0.05	0.55	0.28	0.07	0.05
Schiphol	AMS	0.05	0.11	0.13	0.14	0.36	0.21
Eleftherios Venizelos Airport	ATH	0.00	0.02	0.15	0.41	0.17	0.25
Auckland Intl	AKL	0.10	0.08	0.11	0.13	0.18	0.41
Barcelona	BCN	0.00	0.02	0.40	0.37	0.10	0.10
Belfast Intl	BFS	0.00	0.00	0.18	0.80	0.02	0.00
Schoenefeld	SXF	0.00	0.00	0.18	0.67	0.13	0.03
Bremen	BRE	0.00	0.00	0.25	0.03	0.44	0.28
Brisbane Intl	BNE	0.05	0.10	0.16	0.40	0.08	0.22
Bristol/Lulsgate	BRS	0.00	0.00	0.19	0.44	0.00	0.37
Brussels Airport	BRU	0.00	0.09	0.11	0.20	0.23	0.36
Brussels S. Charleroi	CRL	0.00	0.00	0.96	0.00	0.04	0.00
Kastrup	CPH	0.00	0.02	0.14	0.18	0.35	0.31
Dublin	DUB	0.02	0.02	0.72	0.03	0.04	0.18
Dusseldorf	DUS	0.03	0.03	0.18	0.19	0.29	0.29
East Midlands	EMA	0.00	0.05	0.38	0.28	0.13	0.17
Frankfurt-Hahn	HHN	0.00	0.00	1.00	0.00	0.00	0.00
Frankfurt International Airport	FRA	0.10	0.12	0.21	0.13	0.34	0.10
Geneva International Airport	GVA	0.01	0.01	0.09	0.38	0.31	0.19
Costa Brava	GRO	0.00	0.00	0.99	0.00	0.01	0.00
Glasgow International	GLA	0.02	0.02	0.06	0.31	0.13	0.46
Helsinki-Vantaa	HEL	0.02	0.03	0.10	0.15	0.34	0.36
Hong Kong Intl	HKG	0.39	0.24	0.18	0.16	0.03	0.00
Ataturk	IST	0.03	0.07	0.26	0.49	0.14	0.01
O.R. Tambo International Airpor	JNB	0.07	0.09	0.06	0.21	0.31	0.26
Leeds/Bradford	LBA	0.00	0.06	0.18	0.27	0.01	0.48
Lisboa	LIS	0.01	0.09	0.12	0.36	0.24	0.18
Liverpool Intl	LPL	0.00	0.00	0.37	0.46	0.00	0.17
Gatwick	LGW	0.04	0.07	0.11	0.52	0.18	0.08
Heathrow	LHR	0.15	0.16	0.21	0.18	0.27	0.03
Luton International	LTN	0.00	0.03	0.42	0.51	0.00	0.03
Barajas	MAD	0.03	0.07	0.41	0.22	0.13	0.15
Manchester Intl	MAN	0.05	0.11	0.14	0.19	0.16	0.35
Tullamarine	MEL	0.09	0.14	0.21	0.41	0.03	0.11
Malpensa	MXP	0.02	0.07	0.09	0.47	0.23	0.13
Franz Josef Strauss Airport	MUC	0.03	0.05	0.17	0.21	0.23	0.31
Oslo Airport	OSL	0.00	0.00	0.24	0.19	0.40	0.16
Charles De Gaulle	CDG	0.07	0.09	0.15	0.22	0.33	0.14
Orly	ORY	0.05	0.01	0.23	0.32	0.23	0.16
Ruzyne	PRG	0.00	0.01	0.13	0.29	0.18	0.40
Ciampino	CIA	0.00	0.00	0.92	0.08	0.00	0.00
Fiumicino	FCO	0.01	0.07	0.24	0.47	0.12	0.09
Changi	SIN	0.16	0.30	0.29	0.17	0.05	0.03
Stansted	STN	0.00	0.00	0.57	0.25	0.14	0.03
Arlanda	ARN	0.01	0.01	0.19	0.15	0.40	0.25
Kingsford Smith	SYD	0.11	0.17	0.14	0.29	0.03	0.26
Vienna International	VIE	0.01	0.02	0.18	0.16	0.35	0.28
Zurich	ZRH	0.04	0.05	0.14	0.10	0.40	0.27

Figure 10: Weightings by aircraft size, 2010

3.2.3 An Index of Prices for Representative Tariffs

These basket figures for individual airports permitted the construction of an index of prices. This requires two stages

1. correcting for currency and inflation as described above and
2. weighting.

The weightings applied to this part of the analysis essentially represent the importance of a particular data point in forming an overall index. In this case we have assessed a number of different weightings:

- aeronautical revenue, where the data point for each airport is weighted by the aeronautical revenue for that airport, meaning the airports with high aeronautical revenue contribute more to the average than those with low aeronautical revenue (exchange rates and inflation corrections were chosen to match the corrections of the particular average revenues being compared)
- passengers, where the data point for each airport is weighted by the number of passengers handled by that airport, meaning large airports contribute more to the average than small airports
- similarly, flight frequencies, where the data point for each airport is weighted by the number of flights handled by that airport, again meaning large airports contribute more to the average than small airports
- seat capacities, where the data point for each airport is weighted by the number of seats flown from that airport, again meaning large airports contribute more to the average than small airports
- artificial weights constructed to increase the representation of airports that are considered peers to the airport being assessed
- unweighted, which is a simple mean average of the tariffs.

It is essentially a matter of opinion which of these weightings best matches the relative importance of the data point.

Revenue weightings are particularly natural, not least as they are often used in regulatory rules for calculating average prices. In the case of revenue weightings for regulatory price indices, it is common to use lagged weights, i.e. revenue weights for an earlier year than those for which the prices are calculated. However this is a matter of practicality – typically only lagged weights are available in applying such a regulatory rule. In the present case, it seemed appropriate to match the revenue weights to the time of the revenue per passenger data, as both would be available together. In this case though, airports that increase prices faster, increase their representation in such an index, so it tends to report higher increases than the other indices.

Other weighting schemes involve large scale data collection and necessitate interpolation: frequencies and capacities were taken for each airport for just three years (2003, 2007 and 2011), and interpolated for the years from 2001 and between these three points. Weighting by scale also tends to increase the relative contribution of large airports, which might distort the outcomes. To avoid such distortions and for simplicity, the averages shown in the example calculations are unweighted.

In the results of this study, in Section 4 below, we report unweighted results. This is because other weightings have systematic effects on the indices calculated, which may be hard to justify, given their application is essentially a subjective matter. Applying different weightings creates different values for the *average,* although this is not significant (Figure 11 shows a maximum range of 15% from the unweighted average), although we consider the unweighted average to be most appropriate.

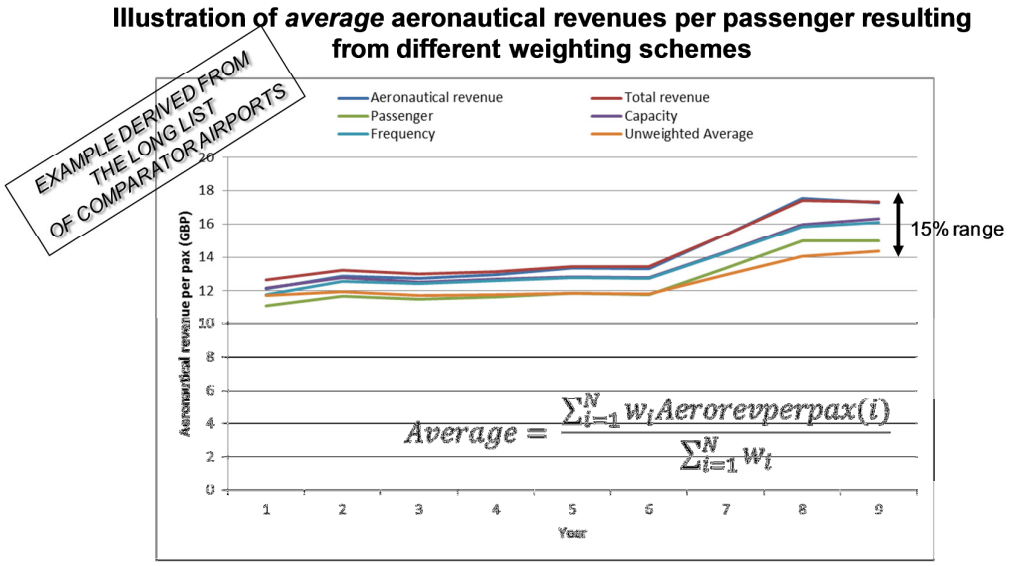

Figure 11: Impact of different averaging techniques

Taking the representative tariffs for each aircraft, a weighted *revenue per aircraft* and a weighted *revenue per passenger* index were then calculated by applying the reconstructed tariff elements to the frequency, capacity data and load factors (applying industry average load factors to ensure consistency across airports).

The results of the calculation to construct this index for each tariff – per aircraft and per passenger – produce different results as each is based upon different approximate representations of the airport's traffic and its tariff.

The results in Section 5 of this report show the relative price index for tariffs on the basis of per passenger revenues.

3.2.4 Conclusion on Published Tariff Comparisons

Within the constraints of data and resources for the project we are confident that the approach outlined above is a sensible and robust way to construct a comparison of published tariffs.

However, given the degree of inaccuracy inevitable with applying the multitude of factors that make up a typical tariff, exacerbated by uncertainty over potential discounts, we consider it a less reliable method than the comparison based on aeronautical revenues set out in the next section.

As indicated in 3.2.1,, this comparison based on tariffs has greater relevance for airports subject to regulation and/or those that are able to insist on their tariff and so provides a useful input to the CAA's consideration of price regulation. The review of tariffs can also provide an indication of the presence of discounts when it is compared with the aeronautical revenue approach described below.

3.3 Comparing Aeronautical Revenues

3.3.1 Nature of Aeronautical Revenues

Comparing prices using reported aeronautical revenues gives a better indication of the level of charges when an airport offers significant discounts to its advertised tariff, or routinely negotiates off-tariff deals with its major customers. Indeed a comparison between the two kinds of data will give an indication to the degree to which an airport offers discounts. Comparing aeronautical revenues also has the virtue of

simplicity of analysis. In addition, it is also a good proxy for the actual charges after discounts. There are, however some disadvantages that should be taken into account.

A key disadvantage is that data is far from universally available or only available at group level for groups of airports. Further challenges lie in the fact that aeronautical revenues will usually include charges received from private aviation and cargo-only flights, for which adjustments are needed (see Section 3.1.2).

Data is also usually only available when accounts are published. This can mean a significant time lag in the availability of data. Accounting periods also vary from one airport to another (requiring further adjustments) and where data is available there is a risk that corporate restructuring, government regulation or other changes could remove it.

3.3.2 Approach to Comparing Aeronautical Revenues

As described in Section 2.10 aeronautical revenue is available for the majority of airports in each of the comparator baskets. In a few cases where only group data is available – AENA, Aéroports de Paris and Fraport – we have included group data as a proxy for the airport data (Madrid, Charles de Gaulle/Orly and Frankfurt Main respectively) on the basis that the named airport is dominant in that group.

Data have been adjusted by simple quarter fractions onto a uniform calendar year basis (e.g. 25/75 for a 31 March year). We have collected data on total revenue as well as aeronautical revenue, since single till regulation implies regulation of all revenue, even if the instrument of regulation is the aeronautical tariff.

The revenue per passenger is calculated by dividing revenue (aeronautical, non-aeronautical, and total) by the number of passengers (one-way) taken from the airport's own records. Corrections have been made as far as possible to ensure that the baskets of activities generating the revenues are comparable across airports, e.g. revenues from non-core activities such as ground-handling and self-operation of car-parks have been removed where there is sufficient granularity of revenue data.

As with the approach to published tariff comparisons, converting this data to an index involves correcting for currency and inflation and weighting (as described above).

4. Example Results – Price Comparison by Aeronautical Revenues

The following sections provide examples of the results generated by the aeronautical revenue analysis described above. These results are derived from the sample sets generated using the criteria and associated weightings described in Section 2, but are restricted to the airports for which reliable revenue data is available.

4.1 Gatwick

On the basis of the aeronautical revenue approach Gatwick has moved from being towards the lower to middle end of the range of its comparators as shown in the chart below.

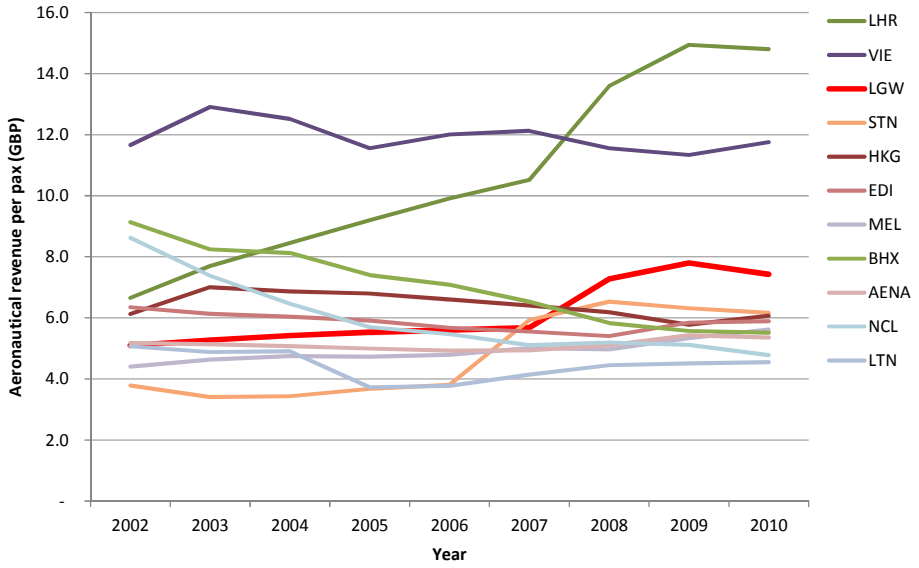

Figure 12: Aeronautical revenue per passenger for the Gatwick comparator basket

As shown above, Heathrow, and Vienna are outliers with much higher charges than other airports. Clearly removal of these outliers would reduce the average but they are left in because the basket of comparators was made on an as objective as possible assessment. A review of the average of the basket further illustrates Gatwick's position (note that the average includes the airports in the sample but excludes Gatwick). Gatwick has moved from below to slightly above the unweighted average between 2002 and 2010.

In addition to the unweighted average, the average calculated using a PPP approach is shown. The figure also shows the average derived solely from the airports in the basket that are subject to light-handed regulation (i.e. airports that could be considered to be operating in a competitive market). As expected, this latter average is much lower than the one generated from the complete sample and could provide a better reflection of the competitive price (although this could also reflect other factors such as the degree of capacity utilisation).

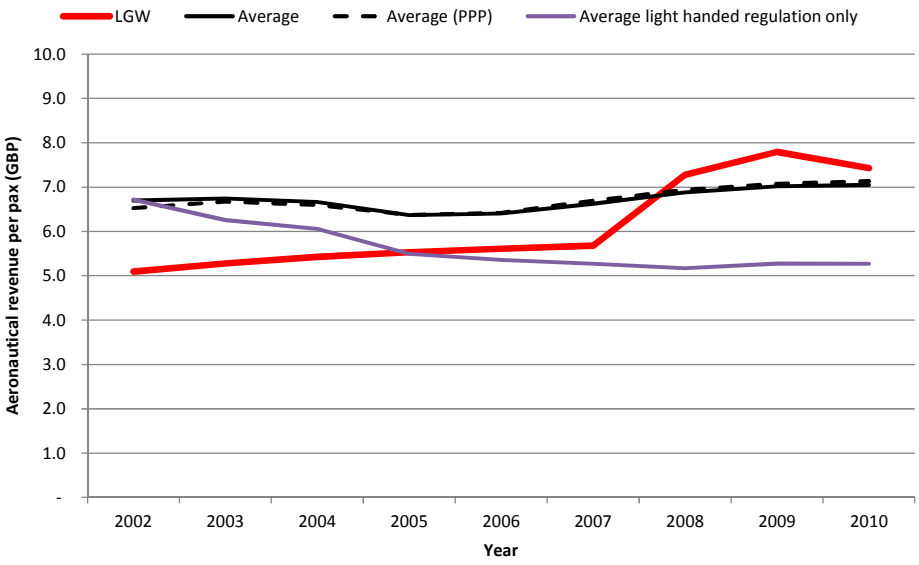

Figure 13: Gatwick's aeronautical revenue per passenger compared to the basket average

4.2 Stansted

Since 2002, Stansted has moved from having the lowest charges to above average charges against its comparators.

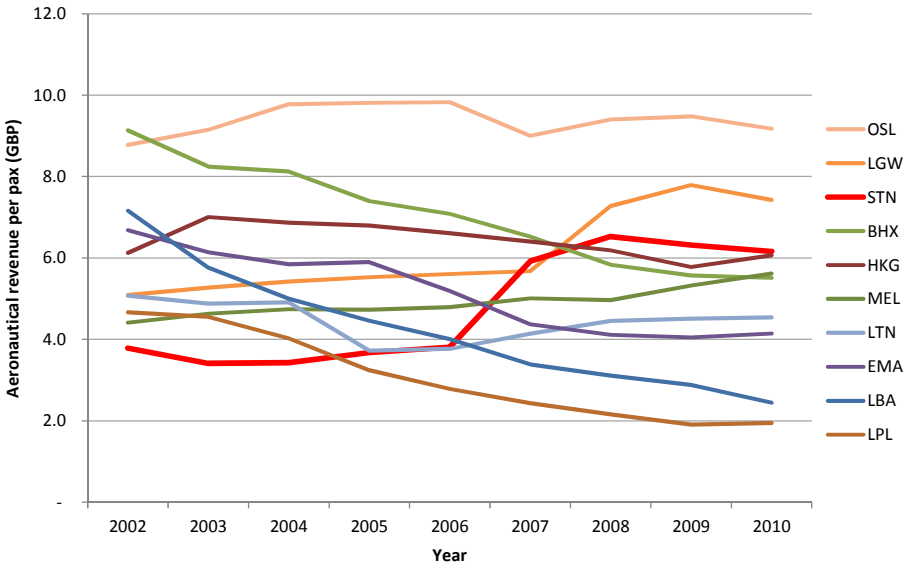

Figure 14: Aeronautical revenue per passenger for the Stansted comparator basket

The results show, in the following figure, that Stansted's aeronautical revenue per passenger has increased so that it is now above the comparator unweighted mean average. In addition to the unweighted average, the average calculated using a PPP approach is shown. Because of the composition of the comparator basket, this PPP average is lower than the unweighted average.

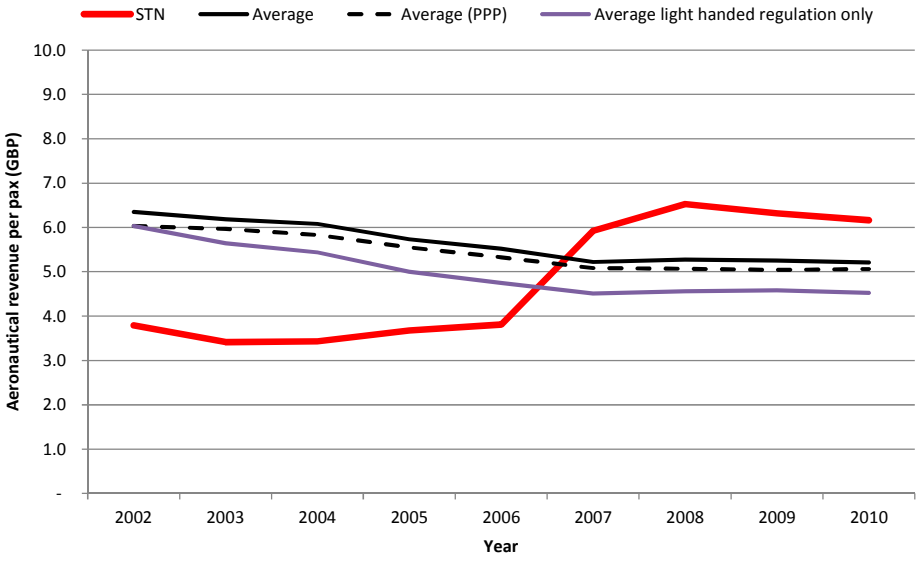

Figure 15: Stansted's aeronautical revenue per passenger compared to the basket average

The figure also shows the average derived solely from the airports in the basket that are subject to light-handed regulation (that is, they could be considered to be operating in a competitive market). As expected, this latter average is lower than the one generated from the complete sample and may better reflect a competitive price, although this could also reflect other factors.

4.3 Heathrow

Over the period analysed, Heathrow has moved from having the second lowest aeronautical revenue per passenger to the equal highest in the basket, identical to Aéroports de Paris (ADP). The figure shows that the available basket of comparators is polarized into two groups: those with high aeronautical revenue per passenger (LHR, ADP and AMS) and those with low (LGW, FRA and HKG).

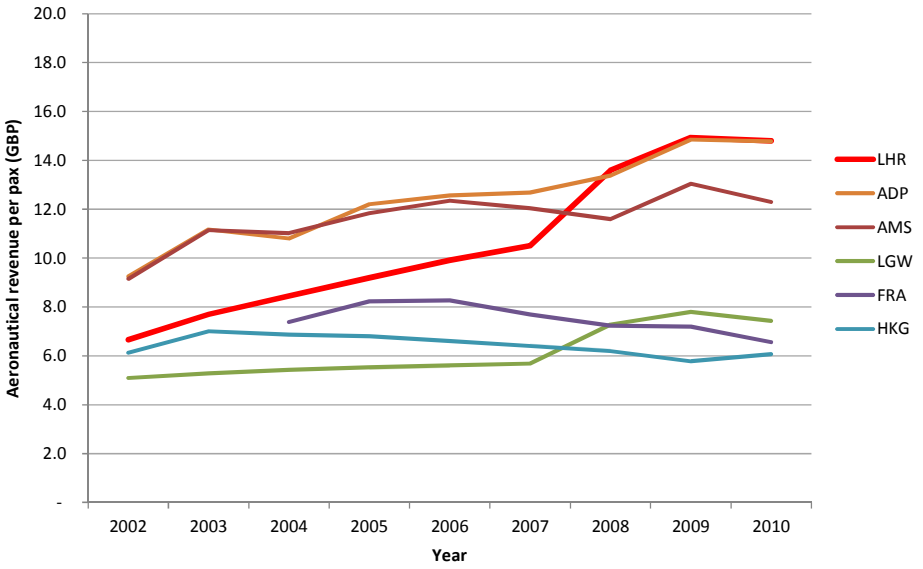

Figure 16: Aeronautical revenue per passenger for the Heathrow comparator basket

Although based on a one-to-one comparison Heathrow is very similar to ADP, it has moved to well above the average of its comparator basket considering both an unweighted average and an average taking PPP into account. It is not possible to make comparisons between Heathrow and airports subject to light-handed regulation as there are none with appropriate revenue data in the comparator basket.

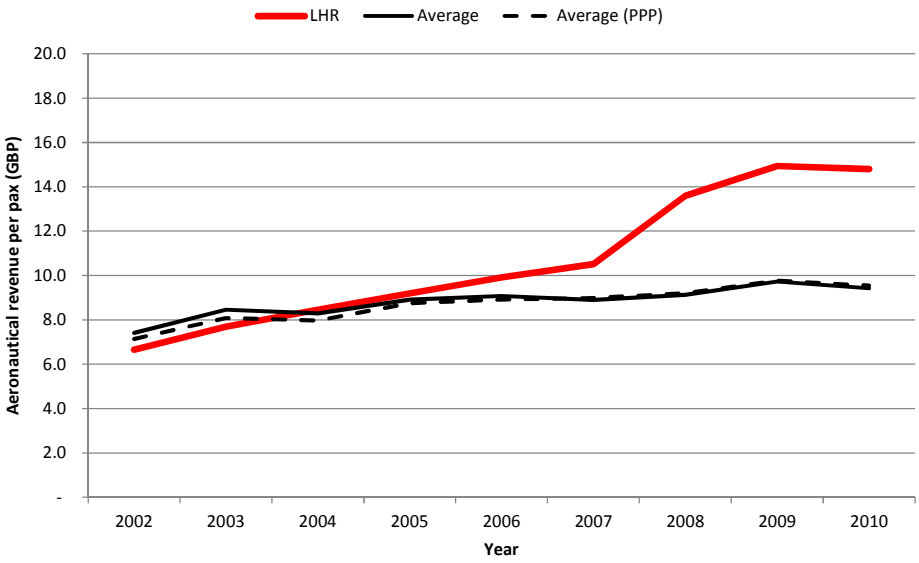

Figure 17: Heathrow's aeronautical revenue per passenger compared to the basket average

5. Example Results – Price Comparison By Tariffs

The following sections provide examples of the results generated by the tariff analysis described above. These results are derived from the sample sets generated using the criteria and associated weightings described in Section 2 but are restricted to the sample of airports for which prices based on tariffs have been constructed as described in Section 3.

5.1 Gatwick

On the basis of the tariff approach Gatwick's aeronautical revenue per passenger has consistently been at the bottom of the sample of comparators. As this tends to contradict the observations made on aeronautical revenue per passenger (Figure 12Figure 14) albeit with the caveat of different samples, this suggests discounting from the tariffs, with a lower level of discounting for Gatwick. This brings into question the validity of comparisons using the tariff approach for Gatwick as tariffs do not appear to reflect actual charges.

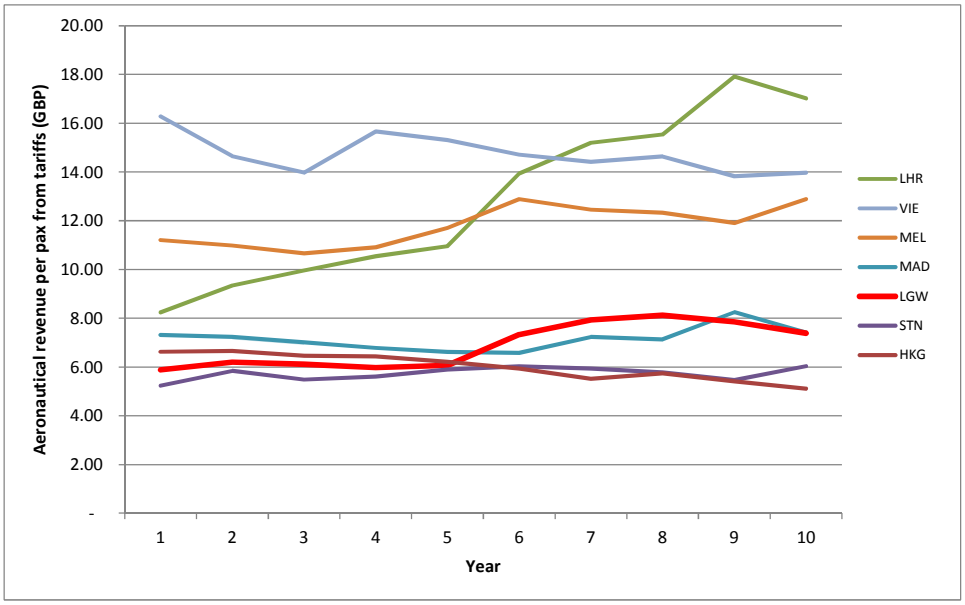

Figure 18: Aeronautical revenue per passenger derived from tariffs for the Gatwick comparator basket

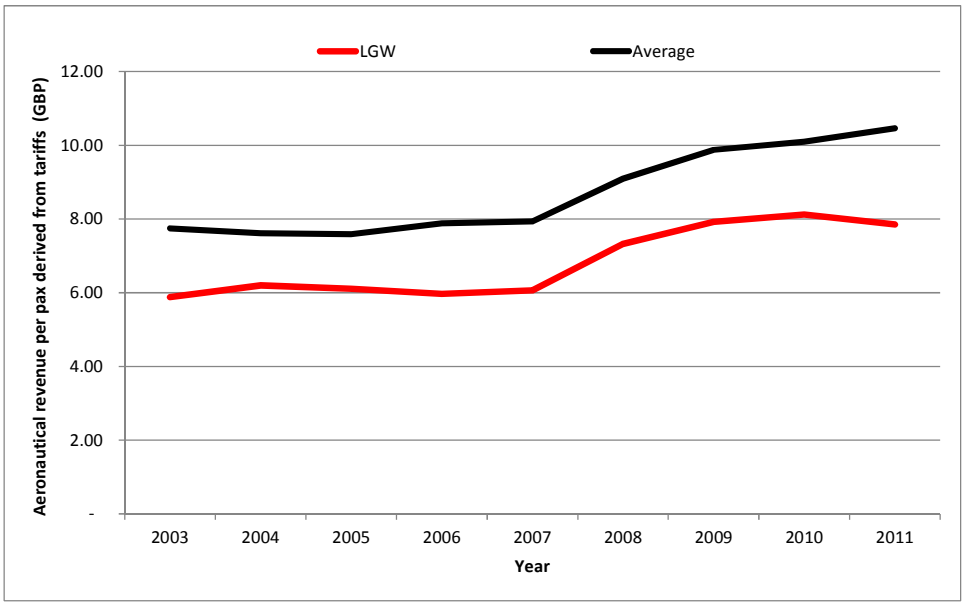

Figure 19: Gatwick's aeronautical revenue per passenger derived from tariffs compared to the basket average

5.2 Stansted

Stansted has also consistently had the lowest aeronautical revenue per passenger derived from tariffs compared to its comparator group, as show in the following figures. Similarly to Gatwick, this tends to contradict the observations made on aeronautical revenue per passenger (Figure 14) again with the caveat of different samples; this suggests discounting from the tariffs, with a lower level of discounting for Stansted. Again this brings into question the validity of comparisons using the tariff approach for Stansted as tariffs do not appear to reflect reality in pricing.

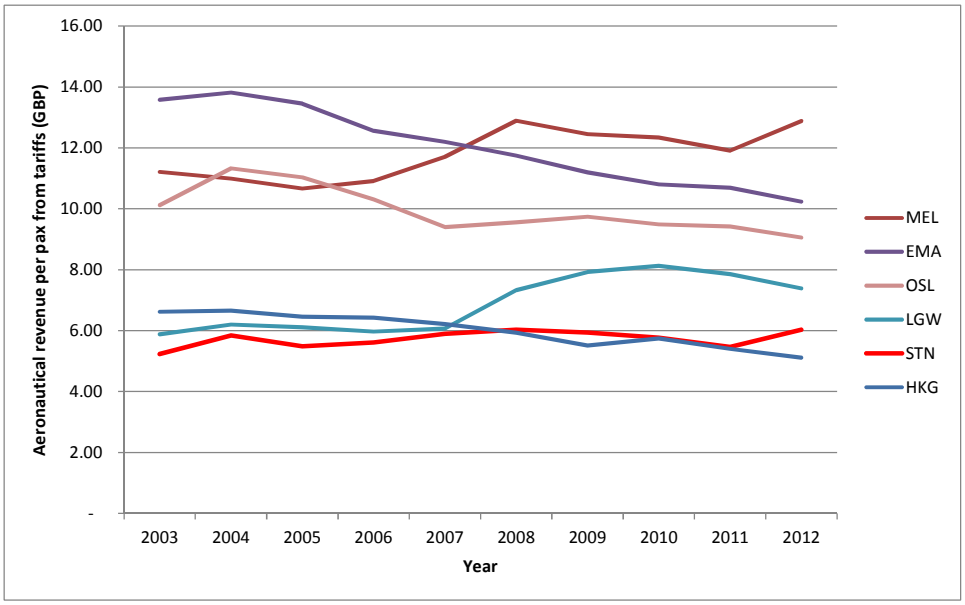

Figure 20: Aeronautical revenue per passenger derived from tariffs for the Stansted comparator basket

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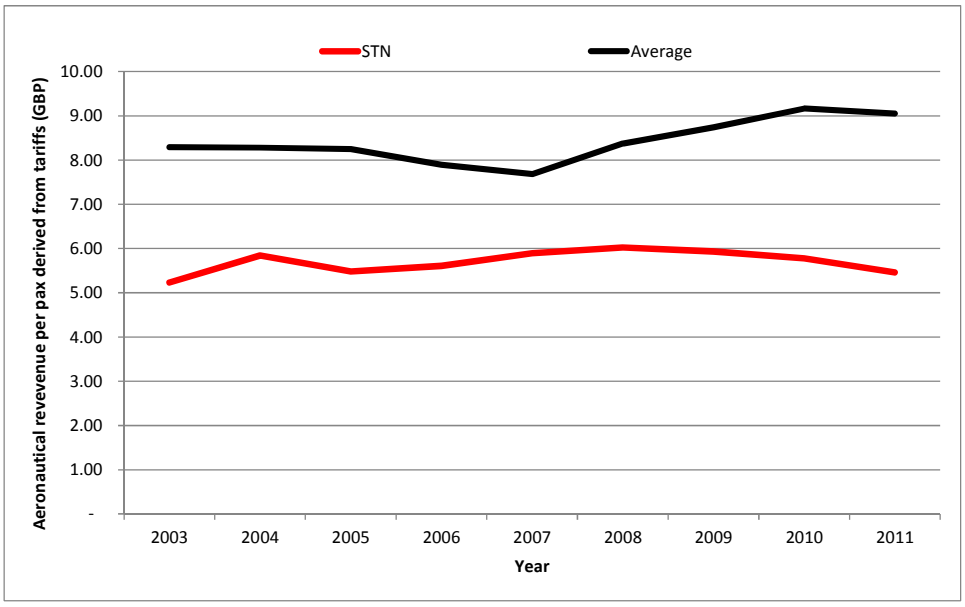

Figure 21: Stansted's aeronautical revenue per passenger derived from tariffs compared to the basket average

5.3 Heathrow

Over the period analysed, Heathrow has moved from having the second lowest aeronautical revenue per passenger derived from tariffs to the highest in the basket. Heathrow is relatively close to three of the main comparators (CDG, FRA and AMS) with two outliers with much lower charges (SIN and LGW). Note in this case, the results for FRA actually represented Frankfurt airport itself whereas the results reported in the aeronautical revenue based approach reflect the Fraport Group. This may go some way to explaining the differences for Frankfurt between the two approaches. Discounting at Frankfurt could also be a further explanation, as could contribution from the other airports in the Fraport Group. Without additional transparency or granularity in the Fraport accounts, it is not possible to determine precisely the causes of the differences.

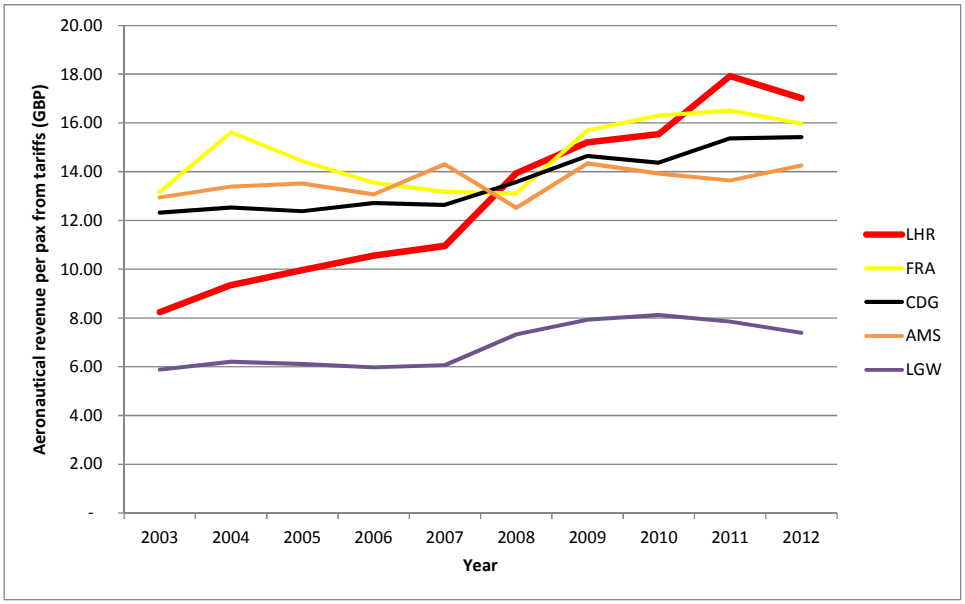

Figure 22: Aeronautical revenue per passenger derived from tariffs for the Heathrow comparator basket

In terms of comparison with the basket average, Heathrow's aeronautical revenue derived from tariffs started below the average in 2003, has increased more quickly than the average and is now above the average.

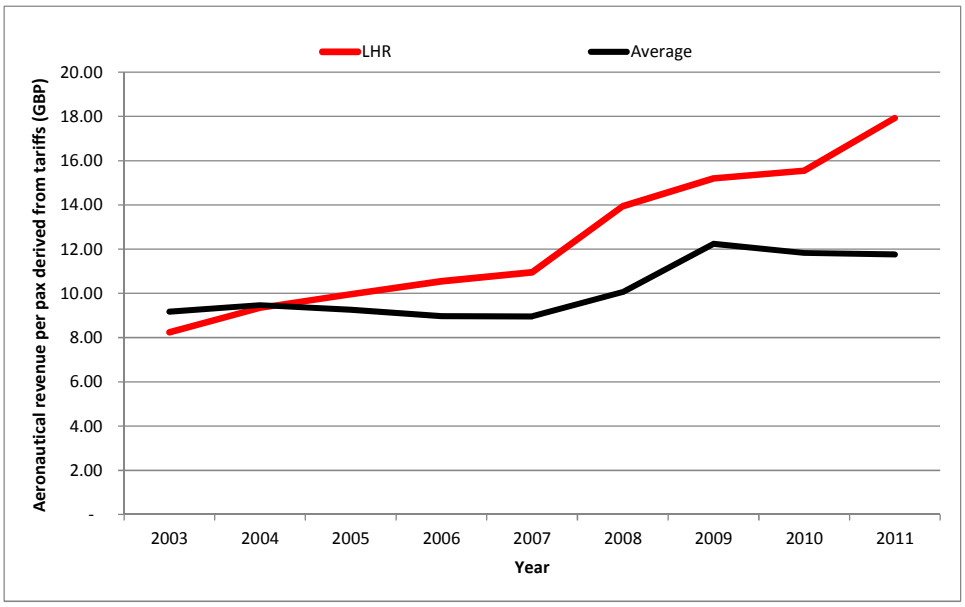

Figure 23: Heathrow's aeronautical revenue per passenger derived from tariffs compared to the basket average

6. Example Results – Price Comparison By Total Revenues

Some stakeholders have stated that this study should take greater account of the single till regulatory approach and encouraged the use of an overall revenue measure, following the argument that it is the total revenue that is most relevant rather than its individual components. As described in Section 3 total revenues as well as aeronautical revenues have been calculated. This section presents the results of the comparison of total revenues.

6.1 Gatwick

On total revenue per passenger Gatwick is in a similar position to that for its aeronautical revenue per passenger and is towards the median of the sample basket.

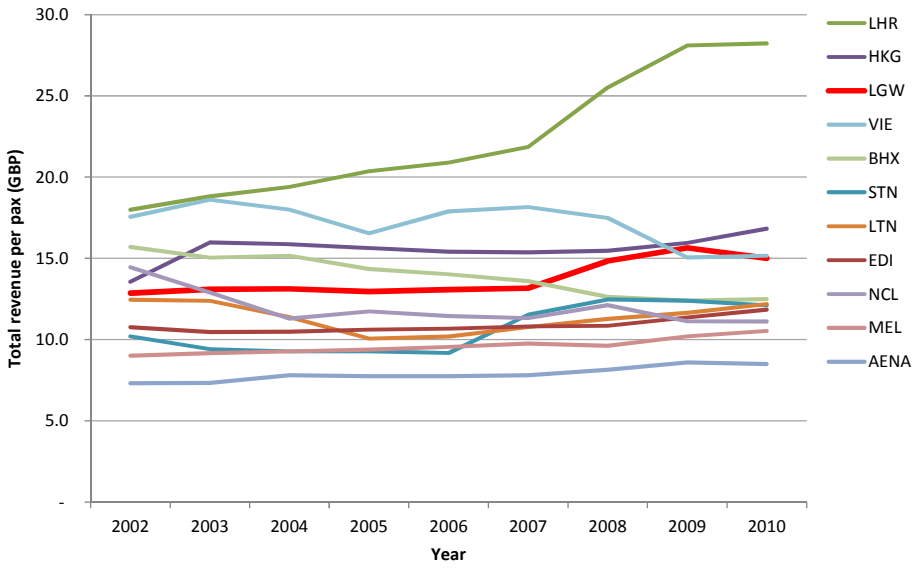

Figure 24: Total revenue per passenger for the Gatwick comparator basket

Gatwick has followed the comparator average of total revenue per passenger closely for the entire period covered and the evolution of total revenue per passenger is flatter than the evolution of aeronautical revenue per passenger. Considering both total revenues (Figure 25) and aeronautical revenues (Figure 13) per passenger, Gatwick is at the unweighted average of its comparator group. This indicates that it is achieving the total revenue that might be expected for an airport of its characteristics. This is achieved from marginally higher aeronautical revenue and marginally lower commercial revenue per passenger than the comparator averages, noting that the comparator basket was built based on drivers for aeronautical revenue per passenger and might be different for commercial revenue. The likely explanation for this is that Gatwick has no incentive to price below its cap, so it was able to increase aeronautical revenue simply by pricing to the cap that the CAA had defined. The increase in commercial revenue has lagged behind this, possibly reflecting the impact of incentives under price cap regulation.

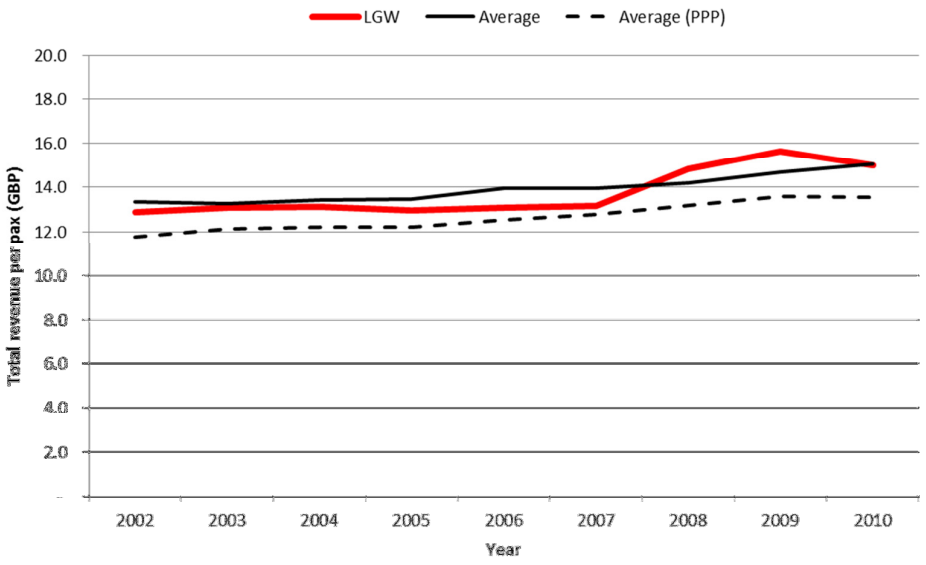

Figure 25: Gatwick's total revenue per passenger compared to the basket average

6.2 Stansted

Stansted remains in a similar position on overall revenues as with aeronautical revenues but it has risen more slowly – but from a higher base – on this measure.

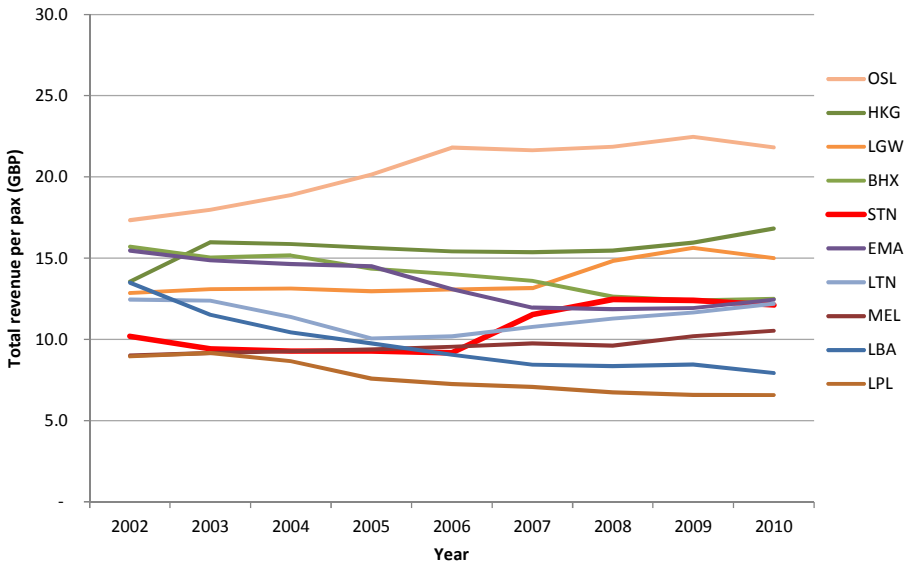

Figure 26: Total revenue per passenger for the Stansted comparator basket

In recent years Stansted has remained close to the average of its comparators, as shown in Figure 27. This shows that, considering total revenues, Stansted is exactly at the level that would be expected for an airport of its characteristics, although the balance of commercial revenues is slightly lower and aeronautical revenue slightly higher (Figure 15) than the average for the comparator sample.

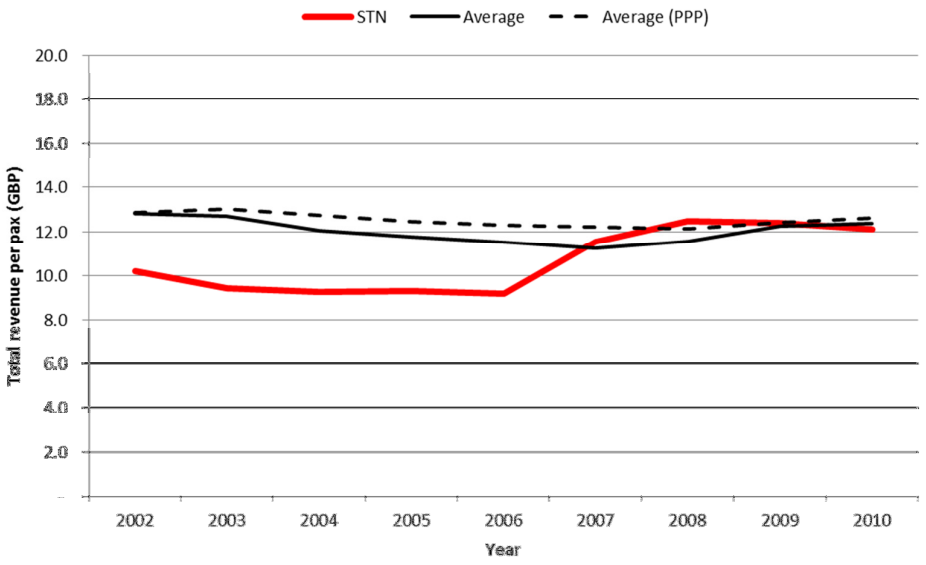

Figure 27: Stansted's total revenue per passenger compared to the basket average

Stansted used to charge well below its price cap but has taken the opportunity to increase its aeronautical charges to move closer to pricing up to its cap. As with Gatwick it has not increased its commercial revenue in line with aeronautical revenue.

6.3 Heathrow

Heathrow has consistently been ahead of its comparators on the overall revenue measure, with the difference increasing over the period investigated, as shown in Figure 28. As the gap between Heathrow and the nearest comparators is greater for overall revenue per passenger than for aeronautical revenue passenger (where for example Heathrow is very similar to ADP, see Figure 16), this indicates that Heathrow's commercial revenue is outperforming that of its most similar comparators.

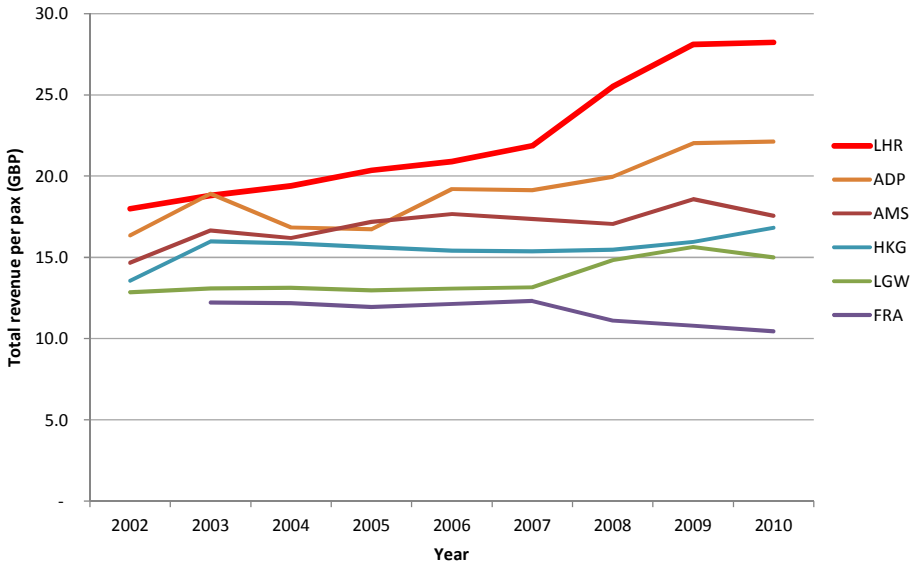

Figure 28: Total revenue per passenger for the Heathrow comparator basket

The comparison against the average of its basket shows Heathrow clearly above the average. This shows that both Heathrow's aeronautical and commercial revenues per passenger are higher than comparator averages.

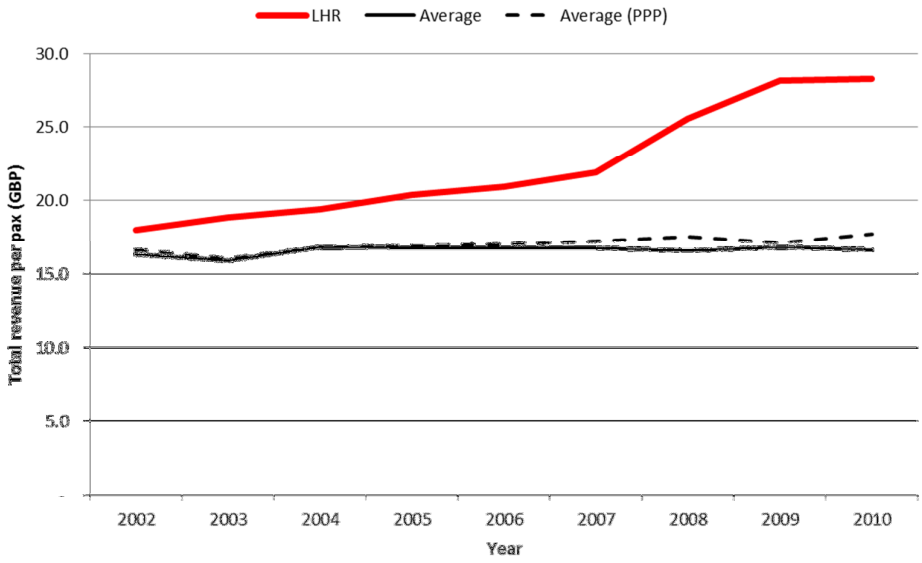

Figure 29: Heathrow's total revenue per passenger compared to the basket average

7. Implications For Regulation Of Airports Using Comparator Prices

7.1 Regulatory Issues

The current assessment of the levels of price control for London airports is partly contingent upon an assessment of past performance, upon which future projections are based. This use of past information from a regulated company produces a regulatory "ratchet effect". The regulatory ratchet is that when a company reveals an ability to produce at reduced cost, this will affect its future regulated price. Consequently while a price control provides an incentive to outperform during a control period, this is weakened by the ratchet effect as the company will be concerned in case it suffers lower prices in future. Over a longer period of regulation, such as the 5-year rules used for London airports, the effect of this form of regulation can be that an airport seeking to take advantage of the regulatory structure could seek to put a focus on cost reduction at the start of the regulatory period so as to maximise the time to enjoy the profits of producing outputs at reduced cost.

Any price control based upon an external benchmark, whatever that benchmark is, removes the ratchet effect. The main situation where an external benchmark could weaken incentives to improve efficiency would be if the benchmark produced a level that was easily profitable given the particular circumstances of the regulated airport. In such a case, the airport may be concerned that high profits would be noticed and the regulator could make some adjustments to remove any advantage. For example, the airport may seek to take inefficient actions or to take a greater share of group costs (where relevant) to reduce the prominence of its profitability.

Regulatory rules can also have further distortionary effects. A RAB based price control can provide incentives to increase capital expenditure (as this provides a regulatory return to the company), or to inflate opex projections (to provide greater scope for outperformance). An external benchmark such as airport price comparators may greatly reduce the scope for manipulation by the regulated company. For example the scope for influence for the regulated company may be limited by the choice of comparators, calculation of the index, or the calculation of its own aeronautical charges.

Currently, airports in the UK are controlled by price cap regulation where a limit is set on the revenue per passenger (the yield) that an airport can earn. For some of the types of index we have been considering, prices are not determined by reference to an allowed yield, but rather by an alternative price control method, referenced to a tariff basket. Under tariff basket control, the percentage increases in each element that makes up the tariff are weighted by the revenue earned by that element.

One consequence of revenue yield regulation is that as the number of passengers per aircraft increase, the airport can increase those charges levied per aircraft by a certain percentage, say ***a***%, so that *overall* revenues will increase but the revenue per passenger on which it is regulated will increase by a smaller percentage (a particular incentive where runway constraints reduce the opportunity to increase overall aircraft movements). This feature is absent with tariff basket method. If all prices in a tariff are increased by ***a***%, the tariff basket increase is ***a***%, as the average is independent of the weights applied. Thus it needs to be understood that in an environment with growth in aircraft size, the level of "X" in RPI±X formulae is not equivalent for different formula constructions.

It is well known that the price cap approach (revenue yield formula) encourages airports with a runway capacity constraint to focus more on the landing charge element and less on the passenger element of their charges, because airports under a price cap wish to expand the number of passengers to in order to increase their overall revenue. The tariff basket formula also has an effect similar in nature in that it encourages airports to increase the least price sensitive element of the charges, which by coincidence is the same as for the revenue yield formula.

What is less well understood is the relative size of the two effects for the two types of formula. To explore this we built a simple simulation model. The results make clear that the amount of additional revenue earned from a given change in balance of the tariff is much greater for the price cap formula than for the tariff basket formula. Thus if a tariff basket formula were brought in it would be likely to have a less distorting effect on tariff decisions than the present price cap formula.

7.2 General Concerns and Issues Raised by Stakeholders

During the study, several issues were raised by stakeholders over the overall approach to regulation implied by the existence of the study, in particular:

- How comparing prices could be practically applied to the regulation of airports over time and in particular whether there are sufficient data available in a timely way
- Whether the debate over the affordability of Heathrow's prices has been properly framed.

Determining whether and how this approach can be used for regulation is outside the scope of this report, but we address some of the key concerns in the following paragraphs and offer some general conclusions in the final section of this report.

7.3 Practical Application of Price Benchmarking to Regulation

For each airport the appropriate basket of airports may change over time. This could raise questions over the practicality of using this approach for regulation.

This report describes a framework for creating a sample of comparator airports and provides illustrative results based on this framework that are effectively a "snapshot" of price comparison. The framework is such that the sample can be adjusted year-on-year and, depending on how different airports evolve, over time the relevant comparators for individual airports may change. It may therefore be important to consider whether the basket of airports should change over time. Maintaining a consistent basket would have the advantage of predictability and avoid potential costs of changes. The availability of reliable data given the time lags and cases where publication is limited remain obstacles.

However, we do not believe that the principle of using price comparisons to inform the regulatory discussion is undermined by these obstacles which are recorded here since they are of interest to stakeholders, and they have been highlighted so that the CAA can consider practical issues for regulation in the light of the findings of this study.

The robustness of the technique and the availability of data notwithstanding, there are inherent uncertainties associated with statistical techniques. There uncertainties depend on factors such as

- sample size, that is how well do the parameters derived from the sample reflect the population
- inherent uncertainties on the accuracy of data, especially where estimates have had to be made (e.g. in adjusting for the impact of ATC and freight revenues)
- the precise portfolio of activities that generate revenue to ensure like for like comparisons.

To some extent these uncertainties will be diminished by averaging across airports and maximising the size of the sample. Any error in one individual airport measurement, when spread across all airports in the sample, will be relatively small and to some extent there may be offsetting issues across the sample as long as the errors are random rather than systematic, the former being most likely.

These uncertainties apply to the basket approach described here and the multivariate regression approach introduced in Section 7.3. Given these uncertainties, which can be quantified to a given level of confidence, one option may be to consider the benchmark as a range of prices rather than a single spot price. There are a number of potential ways that this range could be applied, for example by considering a simple percentage up/down shift on the average benchmark, or to allow for a specific standard error either side of the benchmark. If simply the change in prices is being considered then this issue may, to some extent, disappear as long as the errors are consistent from year to year.

7.4 Affordability of Heathrow Prices

One of the drivers for this study is to explore the potential for using comparing prices to shed light on the on-going debate over the "affordability" of prices at Heathrow.

There is clearly a marked difference of opinion between airlines and airports as to the nature of affordability and how it should be treated. In essence, on the basis of the discussions during this study, the position of airline users appears to be that the level of prices at Heathrow today and potentially for the future challenges their ability to expand their operations in the way they would like, or indeed to operate existing services profitability, so that they consider those prices effectively to be unaffordable.

On the other hand, Heathrow airport considers that prices are self-evidently affordable since, they contend, there would be no excess of demand at the airport if they were not (and further they state that the regulatory agreement for Q5 shows that there is such excess demand). This is supported by the observation that slot pairs at Heathrow are effectively traded for considerable sums of money on the secondary market, although this to some extent reflects a shortage of suitable airport capacity in the South East and Heathrow in particular. The airport suggests that affordability should be considered in the context of what value the airlines get from their operations at Heathrow and that on this basis they strongly assert that "affordability" is an inappropriate description.

This study cannot resolve that debate itself but provides an analysis of the relative level of prices at Heathrow and comparable airports. It is clear from this that, with the exception of Charles de Gaulle, current airport charges at Heathrow are higher than most its main comparators (but on a par with its closest comparator), and markedly higher than the charges for some airports. The increase in the Heathrow airport charge price cap of RPI+7.5% during the current control period (the airport charges benchmarking comparison was for 2010) and the potential increase in airport charges during the next control period of RPI+6.8% (as suggested in the Heathrow Initial Business plan) could put Heathrow out of line with its comparators, although, since this is a comparison exercise, it will also depend on the actions of other airports.

8. General Conclusions

8.1 Overview

This project has explored the possibility of using comparisons with other airports' prices as part of the regulatory approach.

In doing so it has established an objective and transparent approach to identifying suitable comparators and established a method by which airport prices can be compared using a time series of aeronautical revenues (or total revenues). While this report has not sought to hide the difficulties in doing so, both with the analysis itself and also in acknowledging that there are challenges to be overcome before it can be used for regulatory purposes, we believe that the project suggests that comparing airport charges can at least inform the regulatory process. It has to be remembered that any form of benchmarking or comparative studies can only deliver results relative to the sample of comparators and gives no indicator of absolute efficiency that may lie behind the prices.

8.2 Selection of Comparators

This report has developed an objective and transparent approach to select comparators for Gatwick, Stansted and Heathrow. It is clear from the analysis itself and from the discussion with stakeholders, that success in using this approach requires that comparators are agreed (or at least nor disagreed with) collectively – as far as possible – by airlines and airports. The larger the sample of comparators, the more robust the approach and outcomes at the cost of extensive data collection and processing. The approach has shown that from the long list of airports originally developed, there are relatively few that are of direct comparability to each of the airports being assessed.

The original long list of comparators has been ranked using objective criteria but there are several areas of discussion about the process by which comparators were arrived at on which a common position would be required in order to ensure stakeholder-wide support. In particular there has been significant debate over these decisions:

- To exclude some criteria for lack of data or, more pertinently, because they reflect a subjective point of comparison, such as service quality, subject to the discussion laid out previously in this report above
- The exclusion of factor costs. Factor costs could potentially explain some of the differences in price. However, to counter this there is a risk that inefficient input costs could be used to justify higher prices and that this may significantly dampen the incentives for efficiency. This could be accounted for using a very granular PPP approach adjusting for the difference economic circumstances of London and other parts of the UK as well as other countries
- The weighting method for each of the criteria applied to generate the results in this report is objective but can be debated. After testing several different approaches, the method adopted was to weight the criteria with its confidence level derived from a multivariate regression (based on feedback from stakeholders) to understand the collective impact of the criteria on aeronautical revenue per passenger. This enables all criteria to be included in the assessment. The elasticity associated with each criterion is accounted for in the difference windows defined for each criterion. Based on the airports for which aeronautical revenue per passenger data is available the precise weighting scheme does not impact on the qualitative results, i.e. the airport's position above or below the comparator average, but does impact on the precise, quantitative difference from the comparator average
- Logically the weighting should reflect the relationship between the criterion and the price. However, the consequence of this approach is likely to be to drive the selection of comparators to airports with

similar criteria and characteristics and hence by extension to similar prices. This might create a positive feedback loop whereby comparisons are limited to groups of airports with clustered prices, rather than being indicative of a market or competitive price

- The cut off point for comparability/qualifying score for inclusion in the basket of comparators could be set at a different level. For large samples, this cut off would not be of particular significance as one or more additions would not affect significantly the overall average. However, the addition (or subtraction) of an airport from a small sample can affect the outcome significantly; especially if that airport is an outlier in the sample (i.e. it has extremely low or high charges).

In acknowledging this debate, we nevertheless consider the overall approach to be reasonable and robust.

8.3 An Alternative Approach Based on Multivariate Regression

The issue of selection of comparators could be reduced by applying an econometric approach based on multivariate regression analysis where the airport characteristics (the criteria used for comparator selection) are the independent variables and the aeronautical revenue per passenger is the dependent variable. This approach would use the regression results to generate a norm for each airport calculated from the regression coefficients with the specific values of the characteristics for each airport. This norm would then be compared to the actual aeronautical revenue per passenger to determine whether the airport is high or low relative to the norm derived from the sample. This approach would avoid the criticism of *apples-to-oranges* comparisons because the airport would effectively be compared with itself instead of a basket of the least dissimilar airports. There would, however, be a significant data gathering exercise needed to support this approach as data would be needed to quantify airport characteristics over a time series of up to ten years, as reported herein using the basket of comparators approach.

During the study, a very simple model was constructed to test this approach using 2010 data. This indicated that the approach is feasible on a single year basis, the data requirements for a time series analysis were prohibitive and, indeed, historical data going back ten years might not be available nor reliable retrospectively. However, the approach could be used to build up a comprehensive picture on an on-going basis going forward and might be beneficial for price monitoring purposes.

8.4 Analysis of Price Comparisons

Comparisons between airports have been based on transparent, quantitative analysis that, as far as possible, accounts for data limitations. We have concluded that comparison of revenues and not tariffs is the most suitable approach, certainly for Gatwick and Stansted where prices at comparator airports are negotiated on a case-by-case basis and often do not reflect the published tariffs.

Several different methods for selection of comparator baskets have been tried. Trends in aeronautical revenue/passenger are robust against variations in the exact airports in the comparator sample, the approach to generating averages and the way exchange rates are treated and qualitative observations are the same. However, precise quantitative results vary in detail depending on the methods and cut-offs applied in generating the comparator baskets. Furthermore, the results may be different depending on whether aeronautical or total revenues per passenger are compared.

The analysis has shown that how the index is calculated can have a small impact on the overall index so that different types of averaging yield results in a range up to ±10% and different approaches to the calculation of a benchmark price, e.g. per passenger or per aircraft, can yield results with a variation of up to ±5%. Statistical effects and data approximations are also likely to result in uncertainties of ±5-10%. Assuming all of these uncertainties are independent, the overall uncertainty is effectively the root mean

square of the individual uncertainties and would therefore be expected to be of the order of ±10-15% (£0.75-£1.11 for LGW, £1.50-£2.20 for LHR and £0.60-£0.90 for STN).

Aeronautical data, although extremely useful, are not always available at the granular level required (e.g. individual airport not group) and because it is largely based on annual reports is often one or two years behind. The sources of aeronautical revenue are also not always transparent and it is likely that the portfolio of aeronautical revenue generating activities (e.g. provision of air traffic control and ground handling) is slightly different at some airports, although clearly the main and core activities are likely to be common to all airports. These differences at the edges are likely to cause uncertainties of a few percentage points in comparisons, and which can average out across airports in a basket. In the best case, analysis would be based on current, detailed revenue data collected from comparator airports to a common specification with a common set of activities. However, this is likely to be difficult to achieve and therefore uncertainties need to be reflected by *error bars* on the quantitative outcomes. At present it is not possible to specify the precise range of this uncertainty but ±10% would appear to be a reasonable approximation.

8.5 Opportunity for Price Comparison

The project suggests that comparing charges can usefully inform the regulatory process if certain obstacles can be overcome. It may be possible to use comparators directly as a limit on prices. Agreement between airports and airlines as to the various issues raised over the technical basis of the comparators and cut-off points etc., can provide a basis for their assistance in the necessary data collection which would enhance the robustness and timeliness of that process.

Price comparisons could (subject to further analysis that is beyond the scope of this study) provide a proxy for a competitive price, albeit generated from comparators operating in various degrees of necessarily imperfect market conditions, and could be employed as part of a price monitoring approach.

Price comparators could also be used to form a benchmark used to inform the capping of charges. This could offer benefits over a purely RAB based regulation by:

- Ensuring that the proxy for competitive price informs the process
- Making prices more related to market conditions, i.e. output focused rather than input driven
- Helping remove the potential distortions in incentives in a RAB-based approach, for example associated with the incentives towards capex investment
- Loosening the link with costs and investment programmes and so creating greater incentives for productive and allocative efficiency
- Potentially reducing the cost of the regulatory process to all stakeholders.