
Aircraft-Related Charges in European Airports: Determinants and Differentiation

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Abstract:

Purpose: This study is focused on determination whether the size of an airport influences the airport's policy regarding the amount of aircraft-related airport charges. Additional test were conducted to determine whether airport charges are dependent on airport profile.

Design/Methodology/Approach: The sample includes airports located in the European Union that in 2019 served more than 5 million passengers (threshold in accordance with the master EU-level Directive 2009/12/EC, 2009). The data records were also grouped into 3 sections representing large hubs, small- and medium-sized hubs and regional/LCC/charter airports. The airport charges data used for the analysis is supplied by own studies and calculation based on airports individual price lists for 2021. The research hypotheses were verified with the use of the classic regression model and Pearson Correlation Coefficient.

Findings: The findings may indicate that larger airports leverage their market position and charge more for aircraft movements. However airports may also apply different policies, depending on whether they belong to small and medium-sized hubs or large ones.

Practical Implications: Better understanding of airport pricing policies and their motivations may help:

- Regulators – to better adjust the policy to the realities and needs of the market.
- Airports – to ensure better and more effective approach airport charges.
- Airlines – to better understand airport policy on airport charges and to enforce their positions on these charges more efficiently, including during their consultations.

Originality/value: The existing research focuses on aeronautical revenue and airport charges in bulk. The proposed approach is more targeted and offers a more in-depth analysis of the nature of airport charges and their determinants at disaggregated level.

Keywords: Airport charges, aeronautical revenue, aircraft-related charges, airport management.

JEL classification: L93, R41.

Paper Type: A research study.

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1. Introduction

Airports play an important role in air transport system being the most important element of its infrastructure, together with the air space. They provide infrastructure and facilities for taking off and landing, as well as handling of aircraft, passengers, cargo and mail. The revenue generated from these activities is called aeronautical revenue. Together with non-aeronautical revenue it makes up total operating revenue of the airport. In general, the issues of non-aeronautical revenue get more coverage in research in terms of their determinants (Fasone, Kofler, and Scuderi, 2016), share and structure development over time (Graham, 2009) as well as strategies used to increase it (Puls and Lentz, 2018), especially with the expansion of low cost carriers (Yokomi, Wheat, and Mizutani, 2017). At the same time, less attention is paid in research to aeronautical revenue which is often taken for granted as it is sometimes wrongly believed to only reflect the underlying cost basis.

Looking from the direct customers standpoint two key groups can be identified: airlines (that are often called users) and providers of commercial facilities. The users are the primary source of aeronautical revenue while providers of commercial facilities bring most of non-aeronautical revenue that is generated when passengers use services and infrastructure that are not directly related to air travel but complement the whole journey experience. Thus non-aeronautical revenue is generated when passengers spend their money in duty-free shops, eat at airport restaurants, rent cars at the outlets located within airport grounds, use airport hotels etc., (Graham, 2014).

On average, for many years now, aeronautical revenue have accounted for roughly 60 per cent of total operating airport revenue, while non-aeronautical for 40 per cent. These numbers were fluctuating slightly over this period and a slightly upward trend of aeronautical revenue share could have been observed (ACI, 2018).

Aeronautical revenue is inherent to the operation of airport infrastructure which is characterized by specific features that have a huge impact on how this revenue is generated, i.e., the way airport charges are designed. These features are generally shared across many other infrastructure facilities used in transport sector like roads, railways, seaports etc. The most important ones in the context of revenue building are high capital intensity and the need of planning in a way that accommodates forecasted traffic in a long-run perspective (Forsyth, 2005). Apart from the invested capital that is expected by the investors to be recovered, airport charges are used to recover operating expenditure as well. This statement is true not only for privately owned and operated airports but also for state-owned ones. ICAO's guidelines explicitly enumerate the depreciation of assets, operating, maintenance management and administration costs to be reflected in airport charges (ICAO, 2009). Often, it is the cost of capital that has a critical impact on the size of airport charges in bulk. At the same time this is one of factors that is most often questioned by the airlines in the course of airport charges consultations.

The approach to airport charges design and review processes differs from airport to airport, also depending on the regulation model they are subject to (Forsyth, Guiomard, and Niemeier, 2020).

2. Key Determinants of Airport Charges – Literature Review

Aeronautical revenue is made up of proceedings coming from the collection of airport charges. The charges are calculated with respect to underlying costs called the cost basis for airport charges. In general, when designing tariffs airport operators are allowed to account for excess revenue beyond the cost basis itself. This is to secure appropriate return on assets as well as a surplus ensuring financing of new or upgraded infrastructure. However, in case of some charges (noise-related charges, emissions charges and security charges) the revenue should not exceed incurred costs (ICAO, 2009).

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Apart from the abovementioned constraints there are further boundaries within which airport operators may set their charging schemes. The general rules that should be applied according to the ICAO's policies (ICAO, 2009), among other provisions, include the non-discrimination clause, transparency of tariffs and holding consultations with users, just to mention the most important ones.

There are a limited number of studies focused on determinants of airport charges and their impact on its level. Most of them focus on aggregate data regarding aeronautical revenue in bulk rather than breaking down airport charges for a more downstream analysis. Based on the nature of aeronautical revenue, it is clear that one of the key determinants of airport charges in general is the cost basis of individual facilities or an aggregate cost, where justifiable. Indeed, the existing research has proved there is a strong link between aeronautical revenue and the costs incurred by providing this kind of services and infrastructure (Choo, 2014). However, this is not the only factor influencing this category of airport revenue. It is pointed out that other factors, such as the GDP of the country where the airport is located, the size of the airport as well as its business focus, also play a role, at least on a per-passenger basis (Fuerst, Gross, and Klose, 2011).

Apart from the abovementioned 'background' factors, airport charges can also be actively used by the airport operator as a management tool to address both strategic

and operational goals and challenges. On the strategic level the appropriate combination of unit rates and incentives can be employed to stimulate market segments that are considered the most important ones. It can be defined on airline business model level (i.e., low-cost or network carriers) or through a more precise targeting – e.g., regional or long-haul flights, leisure or business passengers etc. Apart from setting the charges in a specific way so as to stimulate the desired behavior of airport users (e.g., boosting growth of specific segments of traffic) airport operators can use a wide array of incentives to amplify the stimulus (Jones, Budd, and Pitfield, 2013). In general, whether an airport focuses on business or leisure passengers, direct or connecting passengers, is large or small in terms of traffic volumes it all impacts the approach to airport charges as well as their absolute and per-passenger level (Fuerst, Gross, and Klose, 2011). The abovementioned features are elements of airport business models, but do not define them completely (Rotondo, 2019). That is why we decided to use the term of “airport profile” to denote the business focus of an airport.

Another key factor that impacts aeronautical revenue is the competitive environment of an airport. Although in many cases airports might be considered monopolies for there is only one airport in a given catchments area, in large metropolises or conurbations there are often two or even more airports that serve the area (e.g. London with six airports, Moscow and Melbourne with four airports, Paris and Milan with three airports, Tokyo, Rome, Venice, Warsaw, Kiev and many more with two airports). In such cases airport charges may be dependent on the relative attractiveness of such airports to airport users as well as other differentiating factors (Forsyth, 2016). In most cases of multiple-airport systems at least one of these airports is a hub and at least one is a low-cost-airline-focused airports. Therefore, pricing has to be adjusted accordingly taking into consideration not only the characteristics of the airports (proximity and convenience of connections to city center, overall air connectivity, both air-side and land-side facilities) but also its business focus (network legacy vs. low-cost carriers).

From the point of view of algorithms employed to calculate airport charges these fees depend on operational characteristics of aircraft movements. Aircraft-related charges depend on technical features of the aircraft, usually its size that – in most cases – is expressed in terms of the maximum take-off weight (MTOW), as well as noise and NOx emissions generated by the engines. Time is also an important factor both in terms of duration (e.g., parking charge) as well as time of day of the operation (e.g., for noise charges and parking charges). All the aforementioned factors can be used to differentiate charges applied to different aircraft. The analysis of fleet, frequency, time of operations and other typical characteristics allow airport operators to optimize their pricing strategies in order to achieve operational and strategic goals.

However, it must be stressed that the non-discrimination clause has always to be satisfied and all the differentiation and modulation of charges must not be biased on

a per-airline basis. The differentiation of charges should therefore be based on objective criteria like MTOW, noise emission, time of aircraft movement, etc. Another tool that is frequently used by airports to further augment their impact on airlines' decisions is applying incentive schemes whose main goal is to stimulate launching of new routes and increasing capacity on the existing ones, although there are many other types of incentives (Fichert and Klophaus, 2011).

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Apart from the abovementioned 'background' factors, airport charges can also be actively used by the airport operator as a management tool to address both strategic and operational goals and challenges. On the strategic level the appropriate combination of unit rates and incentives can be employed to stimulate market segments that are considered the most important ones. It can be defined on airline business model level (i.e., low-cost or network carriers) or through a more precise targeting – e.g., regional or long-haul flights, leisure or business passengers etc. Apart from setting the charges in a specific way so as to stimulate the desired behavior of airport users (e.g., boosting growth of specific segments of traffic) airport operators can use a wide array of incentives to amplify the stimulus (Jones, Budd, and Pitfield, 2013). In general, whether an airport focuses on business or leisure passengers, direct or connecting passengers, is large or small in terms of traffic volumes it all impacts the approach to airport charges as well as their absolute and per-passenger level (Fuerst, Gross, and Klose, 2011). The abovementioned features are elements of airport business models, but do not define them completely (Rotondo, 2019). That is why we decided to use the term of "airport profile" to denote the business focus of an airport.

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3. Methodology

The research was based upon the analysis of airport charges implemented at all airports located in the European Union that in 2019 served more than 5 million passengers. This threshold was specified in accordance with the master EU-level directive related to airport charges that is applicable to airports of the aforementioned size (Directive 2009/12/EC, 2009). This directive sets common grounds for airport charges and serves as an underlying regulatory basis. Thanks to such a selection of airports we obtained a relatively uniform cohort of airports in

terms of rules and principles applied in the process of designing and revision of airport charges. The airports that were analyzed are enumerated in Table 1 together with their profile. Based on preliminary analysis of airport charges algorithms as well as literature overview we defined three distinctive profiles for which we expected commonalities in terms of airport charges due to certain similarities in business focus, market positioning and competitive position. Airports that served at least 25 million passengers in 2019 and where hub-and-spoke network carriers were based were identified as large hubs. Small- and medium-sized hubs were airports used primarily by airlines employing the hub-and-spoke network model but with traffic of less than 25 million annually. Lastly, airports focused on point-to-point traffic served by both low-cost and charter carriers as well as feeder flights operated by hub-and-spoke airlines were put in one cohort labeled ‘Regional/LCC/charter airports’.

Table 1. Analyzed airports

| <i>Airport</i> | <i>Profile</i> | <i>Airport</i> | <i>Profile</i> |
|--------------------|---------------------------------|-------------------------|---------------------------------|
| <i>Alicante</i> | <i>Regional/LCC/charter apt</i> | <i>Lyon</i> | <i>Regional/LCC/charter apt</i> |
| <i>Amsterdam</i> | | | |
| <i>Schiphol</i> | <i>Large hub</i> | <i>Madrid</i> | <i>Large hub</i> |
| <i>Athens</i> | <i>Large hub</i> | <i>Malaga</i> | <i>Regional/LCC/charter apt</i> |
| <i>Barcelona</i> | <i>Large hub</i> | <i>Malta</i> | <i>Regional/LCC/charter apt</i> |
| <i>Bari</i> | <i>Regional/LCC/charter apt</i> | <i>Marseille</i> | <i>Regional/LCC/charter apt</i> |
| <i>Bergamo</i> | <i>Regional/LCC/charter apt</i> | <i>Milan Linate</i> | <i>Regional/LCC/charter apt</i> |
| <i>Berlin</i> | <i>Large hub</i> | <i>Milan Malpensa</i> | <i>Regional/LCC/charter apt</i> |
| <i>Bilbao</i> | <i>Regional/LCC/charter apt</i> | <i>Munich</i> | <i>Large hub</i> |
| <i>Bologna</i> | <i>Regional/LCC/charter apt</i> | <i>Nantes</i> | <i>Regional/LCC/charter apt</i> |
| <i>Bordeaux</i> | <i>Regional/LCC/charter apt</i> | <i>Naples</i> | <i>Regional/LCC/charter apt</i> |
| <i>Brussels</i> | | | |
| <i>Charleroi</i> | <i>Regional/LCC/charter apt</i> | <i>Nice</i> | <i>Regional/LCC/charter apt</i> |
| <i>Brussels</i> | | | |
| <i>National</i> | <i>Large hub</i> | <i>Palermo</i> | <i>Regional/LCC/charter apt</i> |
| | <i>Small- and medium-sized</i> | <i>Palma de</i> | |
| <i>Bucharest</i> | <i>hub</i> | <i>Mallorca</i> | <i>Regional/LCC/charter apt</i> |
| | <i>Small- and medium-sized</i> | <i>Paris Charles de</i> | |
| <i>Budapest</i> | <i>hub</i> | <i>Gaulle</i> | <i>Large hub</i> |
| <i>Catania</i> | <i>Regional/LCC/charter apt</i> | <i>Paris Orly</i> | <i>Large hub</i> |
| <i>Cologne</i> | <i>Regional/LCC/charter apt</i> | <i>Pisa</i> | <i>Regional/LCC/charter apt</i> |
| <i>Copenhagen</i> | <i>Large hub</i> | <i>Porto</i> | <i>Regional/LCC/charter apt</i> |
| | <i>Small- and medium-sized</i> | | <i>Small- and medium-sized</i> |
| <i>Dublin</i> | <i>hub</i> | <i>Prague</i> | <i>hub</i> |
| <i>Duesseldorf</i> | <i>Large hub</i> | <i>Rhodes</i> | <i>Regional/LCC/charter apt</i> |
| | | | <i>Small- and medium-sized</i> |
| <i>Eindhoven</i> | <i>Regional/LCC/charter apt</i> | <i>Riga</i> | <i>hub</i> |
| <i>Faro</i> | <i>Regional/LCC/charter apt</i> | <i>Rome Ciampino</i> | <i>Regional/LCC/charter apt</i> |

| | | | |
|----------------------|------------------------------------|--------------------------|------------------------------------|
| <i>Frankfurt</i> | <i>Large hub</i> | <i>Rome Fiumicino</i> | <i>Large hub</i> |
| <i>Fuerteventura</i> | <i>Regional/LCC/charter apt</i> | <i>Sevilla</i> | <i>Regional/LCC/charter apt</i> |
| <i>Gdansk</i> | <i>Regional/LCC/charter apt</i> | <i>Sofia</i> | <i>Small- and medium-sized hub</i> |
| <i>Goteborg</i> | <i>Regional/LCC/charter apt</i> | <i>Stockholm Arlanda</i> | <i>Large hub</i> |
| <i>Gran Canaria</i> | <i>Regional/LCC/charter apt</i> | <i>Stuttgart</i> | <i>Regional/LCC/charter apt</i> |
| <i>Hamburg</i> | <i>Regional/LCC/charter apt</i> | <i>Tenerife Norte</i> | <i>Regional/LCC/charter apt</i> |
| <i>Hannover</i> | <i>Regional/LCC/charter apt</i> | <i>Tenerife Sur</i> | <i>Regional/LCC/charter apt</i> |
| <i>Helsinki</i> | <i>Small- and medium-sized hub</i> | <i>Thessaloniki</i> | <i>Regional/LCC/charter apt</i> |
| <i>Heraklion</i> | <i>Regional/LCC/charter apt</i> | <i>Toulouse</i> | <i>Regional/LCC/charter apt</i> |
| <i>Ibiza</i> | <i>Regional/LCC/charter apt</i> | <i>Valencia</i> | <i>Regional/LCC/charter apt</i> |
| <i>Krakow</i> | <i>Regional/LCC/charter apt</i> | <i>Venice Marco Polo</i> | <i>Regional/LCC/charter apt</i> |
| <i>Lanzarote</i> | <i>Regional/LCC/charter apt</i> | <i>Vienna</i> | <i>Large hub</i> |
| <i>Larnaca</i> | <i>Regional/LCC/charter apt</i> | <i>Vilnius</i> | <i>Small- and medium-sized hub</i> |
| <i>Lisbon</i> | <i>Large hub</i> | <i>Warsaw Chopin</i> | <i>Small- and medium-sized hub</i> |

Source: Own elaboration.

This research is focused on aircraft-related charges. The main goal of this research was to identify whether airports of different sizes and airport profiles have varying approaches to pricing operations of aircraft of different sizes or not.

Airport size may determine airport's potential and actual markets as well as its competitive position. Thus, the larger the airport, the more likely it may be to leverage its position and demand higher prices for the services offered, especially considering that as the number of passengers at the airport increases, the risk of its congestion also rises. That is why airports might employ measures such as increased rates during peak hours in order to shift at least a portion of traffic to less busy times of day. Moreover, high charges may have a discouraging effect on airlines who consider launching new routes. On the other hand, given the economies of scale and possible lower unit costs, these airports may also have the opposite strategies and offer lower airport charges.

Depending on airport profile the focus might be on network legacy carriers, low-cost (and/or charter) carriers or regional carriers. Because of operational differences and needs these airline business models rely on different aircraft fleets. Airports who cater specifically to one of these profiles might offer preferential pricing to aircraft whose specifications are typical for this business model. This is also why we have decided not to include passenger charges in the analysis. The review of airport

charges tariffs revealed that these charges are generally independent of aircraft size (although selected airports might offer different passenger charges depending on destination).

In the analysis the following charges were calculated: runway (landing and/or take-off) charge, environmental charges (noise and NOx emissions) and parking charges. The charges were calculated according to tariffs that were in force on the turn of 2021. Although this was a very special period because of the COVID-19 pandemic, in most cases it had not yet been reflected in the airport charges tariffs as they have a relatively high inertia due to specific rules that need to be obeyed in the process of setting the charges, i.e. the requirement of consultations, approval from civil aviation authority and advance publishing. Moreover, airports rarely take quick action to change airport charges as they rely on long-term cost recovery rather than adjustments to shocks. The scope and timing of the response of individual airports will likely depend on the regulatory regime these airports operate in (Forsyth, Guiomard, Niemeier, 2020).

The charges were calculated for six different aircraft to cover the whole spectrum of the most commonly used ones in the civil aviation – from turboprop and regional jet planes though large single-aisle aircraft to small and large widebodies. Standard specifications of these aircraft were considered for the calculations as per Table 2.

Table 2. Analyzed aircraft and their specifications

| <i>Aircraft type</i> | <i>Number of seats</i> | <i>MTOW [t]</i> | <i>Number of engines</i> | <i>Cumulative noise margin [EPNdB]</i> | <i>NOx/LTO/engine [kg]</i> |
|-----------------------------------|------------------------|-----------------|--------------------------|--|----------------------------|
| <i>Bombardier Q400 (DH8D)</i> | 78 | 28,998 | 2 | 25,9 | 1,28 |
| <i>Embraer 170 (E170)</i> | 70 | 35,99 | 2 | 11 | 2,222 |
| <i>Embraer 195 (E195)</i> | 112 | 50,79 | 2 | 14,7 | 2,836 |
| <i>Boeing 737-800 (B738)</i> | 189 | 78,999 | 2 | 13,2 | 4,763 |
| <i>Boeing 787-8 (B788)</i> | 252 | 227,93 | 2 | 32,1 | 19,198 |
| <i>Boeing 777-300 ER (B773ER)</i> | 428 | 340,194 | 2 | 16,2 | 34,888 |

Source: Own elaboration.

All the charges were expressed in euros (in case of airports whose tariffs were quoted in currencies other than euro conversion at the current ECB exchange rate was performed). In this study we perform tests on one dependent variable which is the amount of the cost of airport airside charges. We decided to test single regressor, e.g. number of passengers served by single airport yearly. As to independent variable we formulate the following hypotheses:

H1: The price of airside airport charges is related to airport size.

H2: The price of airside airport charges is dependent on airport profile.

In order to verify hypotheses we use the classic regression model. As in case of testing the model for different airport profiles we use samples counting less than 30 observations we decided to augment the test by Pearson Correlation Coefficient.

4. Data and Results

The sample contains unbalanced data of 70 EU airports with traffic exceeding the threshold of 5 million passengers annually. The airport charges data used for the analysis is supplied by own studies and calculations based on airports individual price lists for 2021. It should be emphasized that no unified, free of charge data source is available to support our research. Number of passengers per airport is supplied by dataset provided by Eurostat for 2019 as 2020 data was absent at the time of conducting analysis. Moreover due to pandemic effect it would severely impact the results of the study. In this case the 2019 year is more representative for the conducted analysis. Tables 3-6 shows the data descriptive statistics of our study.

Table 3. Descriptive statistics for all analyzed airports

| | <i>Airport charges (EUR)</i> |
|---------------------------|------------------------------|
| <i>Mean</i> | 813,2 |
| <i>Median</i> | 775,5 |
| <i>Maximum</i> | 2529,3 |
| <i>Minimum</i> | 189,6 |
| <i>Std. Dev.</i> | 376,9 |
| <i>No of observations</i> | 70 |

Source: Own calculations.

Table 4. Descriptive statistics for regional/LCC/charter airports

| | <i>Airport charges (EUR)</i> |
|---------------------------|------------------------------|
| <i>Mean</i> | 780 |
| <i>Median</i> | 776 |
| <i>Maximum</i> | 2 529 |
| <i>Minimum</i> | 190 |
| <i>Std. Dev.</i> | 423 |
| <i>No of observations</i> | 45 |

Source: Own calculations.

Table 5. Descriptive statistics for small and medium-sized hubs

| | <i>Airport charges</i> |
|---------------------------|------------------------|
| <i>Mean</i> | 852,7 |
| <i>Median</i> | 891,3 |
| <i>Maximum</i> | 1257,5 |
| <i>Minimum</i> | 521,3 |
| <i>Std. Dev.</i> | 268,7 |
| <i>No of observations</i> | 9 |

Source: Own calculations.

Table 6. Descriptive statistics for large hubs

| <i>Airport charges</i> | |
|---------------------------|--------|
| | 884,3 |
| <i>Median</i> | 945,1 |
| <i>Maximum</i> | 1363,9 |
| <i>Minimum</i> | 341,7 |
| <i>Std. Dev.</i> | 282,6 |
| <i>No of observations</i> | 16 |

Source: Own calculations.

Table 7 represents the results of the estimation. As expected the size of the airport determines the level of the airport charges although the conducted test proved rather medium strength of association between variables. Moreover, we noticed a slight decrease of this association with the increase of aircraft size.

Table 7. Estimation of results for all tested airports

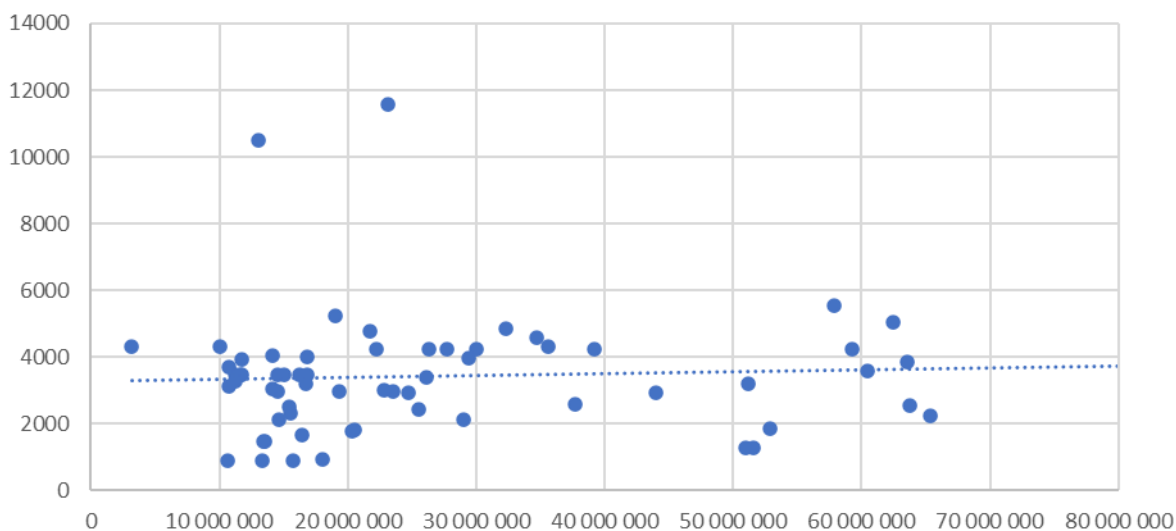
| | <i>Pearson Correlation Coefficient</i> | | <i>Regression analysis</i> | |
|---------------|--|--------------------------|----------------------------|--------------|
| | <i>Coefficient</i> | <i>Significance test</i> | <i>R square</i> | <i>Prob.</i> |
| <i>DH8D</i> | 0,40 | <i>positive</i> | 0,16 | 0,001 |
| <i>E170</i> | 0,38 | <i>positive</i> | 0,15 | 0,001 |
| <i>E195</i> | 0,37 | <i>positive</i> | 0,14 | 0,001 |
| <i>B738</i> | 0,37 | <i>positive</i> | 0,14 | 0,001 |
| <i>B788</i> | 0,08 | <i>negative</i> | 0,01 | 0,493 |
| <i>B773ER</i> | 0,12 | <i>negative</i> | 0,01 | 0,316 |

Source: Own calculations.

The findings may mean that larger airports leverage their market position and levy higher airport charges. However these findings do not apply to long-haul operations as the test conducted for widebody aircraft brought ambiguous results. However as one may notice in the figure 1 in both cases of long haul aircraft two outliers can be recorded, meaning Venice and Milano Linate, two airports of around 11 and 6.5 million passengers annually respectively. Both airports quote airport charges at a significantly higher level in comparison to its competitors.

For the purpose of the research two further analyses were conducted excluding both airports from the test group.

Table 8 shows the average level of airport charges for both tested types of wide-body aircraft. The association proved to be still at a lower level in comparison to narrow-body aircraft. However the elimination of outliers helped to improve results and the interdependency between size of the airport and the level of airport charges for wide-body aircraft is more evident, although the strength of this correlation remains rather low. This can also be an indication that, albeit to a lesser extent, larger airports (in terms of the number of passengers handled) tend to charge more for wide-body aircraft.

Figure 1. Linear association of number of passengers at given airport and the level of airport charges calculated for B788 and B773ER

Source: Own calculations.

Table 8. Estimation of results for all tested airports excluding outliers

| | Pearson Correlation Coefficient | | Regression analysis | |
|--------|---------------------------------|-------------------|---------------------|-------|
| | Coefficient | Significance test | R square | Prob. |
| B788 | 0,22 | negative | 0,05 | 0,066 |
| B773ER | 0,28 | positive | 0,08 | 0,020 |

Source: Own calculations.

As described in the previous part of our study we decided to verify whether the interdependency between the size of the airport and the level of airport charges can be different within separate groups of airports representing different business profiles. Table 9 shows the level of airport charges for regional/LCC/charter airports.

Table 9. Estimation of results for regional/LCC/charter airports

| | Pearson Correlation Coefficient | | Regression analysis | |
|--------|---------------------------------|-------------------|---------------------|-------|
| | Coefficient | Significance test | R square | Prob. |
| DH8D | 0,27 | negative | 0,07 | 0,075 |
| E170 | 0,29 | negative | 0,08 | 0,054 |
| E195 | 0,29 | negative | 0,08 | 0,054 |
| B738 | 0,30 | positive | 0,09 | 0,044 |
| B788 | 0,22 | negative | 0,05 | 0,146 |
| B773ER | 0,20 | negative | 0,04 | 0,182 |

Source: Own calculations.

The association proved to be at a lower level in comparison to general population of tested airports. As in the previous part, especially considering tests excluding outliers, the level of association is lower for wide-body aircraft. However, excessive significance should not be attached to these results as only in case of B738 the tests were statistically significant for 95% statistical significance level. This may mean that the policy on airport charges in the surveyed group of airports corresponds to the general policy identified for the full sample.

Table 10 shows the level of airport charges for small- and medium-sized hubs. The tests performed for small and medium – sized hubs proved that the association between variables is close to zero for narrow-body aircraft. Surprisingly, the association for widebody aircraft seems strong. Moreover, the sign for this association is minus. As in the previous airports group the results should be considered with reserve as none of the tests were statistically significant for 95% statistical significance level.

Table 10. Estimation of results for small- and medium-sized hubs

| | <i>Pearson Correlation Coefficient</i> | |
|---------------|--|--------------------------|
| | <i>Coefficient</i> | <i>Significance test</i> |
| <i>DH8D</i> | <i>-0,10</i> | <i>negative</i> |
| <i>E170</i> | <i>0,02</i> | <i>negative</i> |
| <i>E195</i> | <i>-0,03</i> | <i>negative</i> |
| <i>B738</i> | <i>0,00</i> | <i>negative</i> |
| <i>B788</i> | <i>-0,41</i> | <i>negative</i> |
| <i>B773ER</i> | <i>-0,42</i> | <i>negative</i> |

Source: Own calculations.

The results may mean that small and medium-sized hubs are focused on the development of transfer traffic, where the main driver is long-haul connections served by wide-body planes. The larger the airport, the greater the motivation for development is.

Table 11 shows the level of airport charges for large hubs. Like in case of small and medium – sized hubs tests proved that the association between variables is close to zero for narrow-body aircraft except B738. Also as in a previous example, the association for widebody aircraft seems strong. However in this particular case the sign for this association is positive. As in the previous airports group the results should be considered with reserve as only test conducted for B773ER was statistically significant for 95% statistical significance level.

The results for large hubs may mean that these airports benefit from a strong market position and impose higher airport charges as the port size increases. As previously suggested, this may also be related to the need to limit traffic due to limited capacity. As can be seen, the policy of these ports is focused primarily on large narrow-body

and wide-body aircraft, which mostly operate at airports of this type as a result of the volume of demand and the availability of slots.

Table 11. Estimation of results for large hubs

| | <i>Pearson Correlation Coefficient</i> | |
|---------------|--|--------------------------|
| | <i>Coefficient</i> | <i>Significance test</i> |
| <i>DH8D</i> | <i>-0,01</i> | <i>negative</i> |
| <i>E170</i> | <i>0,06</i> | <i>negative</i> |
| <i>E195</i> | <i>0,02</i> | <i>negative</i> |
| <i>B738</i> | <i>0,29</i> | <i>negative</i> |
| <i>B788</i> | <i>0,29</i> | <i>negative</i> |
| <i>B773ER</i> | <i>0,53</i> | <i>positive</i> |

Source: Own calculations.

5. Conclusions

The conducted research proved that the research hypothesis, “The price of airside airport charges is related to airport size” can be confirmed partially only. The correlation between two tested variables is of a medium strength for regional and 100-200 seater aircraft. The research conducted for long haul, wide-body aircrafts did not bring unambiguous answer. Only analysis with elimination of outliers brought statistically significant results for B773ER however the strength of association proved to be small. The findings may mean that airports that serve more traffic leverage their market position and apply higher airport charges.

As in case of H1 also in case of H2 “The price of airside airport charges is dependent on airport profile” it was only partially confirmed. The results for regional/LCC/charter airports were similar to these in the whole population of tested airports, although the strength of association was visibly lower. Moreover the tests conducted for small, medium and large hubs did not show any association for narrow body aircraft, except the B738 in case of large hubs. The association seems however of a medium strength for wide body aircraft. Surprisingly for small- and medium-sized hubs the aircraft-related airport charges are lower at larger airports within group while in case of large hubs this relationship is reverse. It may mean that small- and medium-sized hubs are more growth oriented in terms of long-haul traffic, while at large hubs this segment is relatively saturated and there is less focus on stimulating its growth. As already mentioned these findings should be treated with caution, as most of the tests did not meet the 95% statistical significance criteria.

The results obtained may indicate that airports apply different policies, depending on whether they belong to small and medium-sized hubs or large ones. In the case of airports within the first group, larger airports try to attract long-distance traffic, and thus transfer traffic, with price incentives, while in the second group, airports use their competitive position and the possibility of imposing higher charges.

To conclude, the size of the airport has an impact on the level of airport charges, however the strength of this association is different for wide-body and narrow-body aircraft. Moreover its strength is not high. We also distinguished different policies implied in case of small and medium-sized or large hubs. That must be explained by other variables influencing airport pricing policies, which was however not a subject of this study. One of the explanations of this situation can be for example the fact that in some countries most of the airports are operated by one operator who uses similar or even the same airport charges approach to different airports. Moreover, competitive strength in relations with airlines as well as competitive advantage or disadvantage in comparison with other airports may play a crucial role. This however is an area for further research.

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