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The Airport Charges Directive and the level of airport charges

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Abstract

This report presents results of the impact evaluation of the Directive 2009/12/EC - the Airport Charges Directive (ACD) - on the level of airport charges. The ACD aimed to influence *inter alia* the balance of bargaining power between airlines and airports in order to promote efficient airport operations and enhance the internal aviation market. The rules set out by the ACD apply to airports that registered more than 5 million passengers per year and to the largest airport in each Member States (MS). This feature allowed the evaluation to be designed by comparing charges of airports handling more than 5 million passengers to the ones of airports below the 5 million threshold, before and after the transposition of the ACD in their respective MS. Empirical results suggest that the ACD reduced airport charges by up to 10% for both low-cost and full-service airlines in the case of EU short-haul flights. This effect is statistically relevant, albeit with a low degree of confidence, after three years following the implementation. In the case of airports serving more than 20 million passengers, that were compared to American and Asian airports of similar size, the estimates do not reveal any statistically significant effect on airport charges associated to the introduction of the ACD.

1 Introduction

The Directive 2009/12/EC - the Airport Charges Directive (ACD) - was approved on 11 March 2009 and transposed into national legislations by Member States (MS) in the period 2011-14.

The directive establishes "a common framework regulating the essential features of airport charges and the way they are set" (Directive 2009/12/EC). The airport charges are levied to airlines for financing services provided by the airport managing body related to take-off, landing, lighting and parking of aircrafts as well as to the processing of passengers and freight.

Airports are essential facilities for airlines because they provide a key input for the provision of their services. Some airports might have some degree of market power in setting charges because of the limited competition they face from nearby airports or other airports in case of transfer traffic (and for certain point-point-traffic) and from inter-modal competition (e.g. from high speed rail networks).[1] Factors possibly contributing to such a market power include the size of the airport, the mix of destinations offered (e.g. short-haul versus long-haul), the status of the airport (hub versus non-hub), the presence of other airports not in common ownership in the same catchment area as well as the existence of inter-modal competition for some key destinations.

In order to mitigate possible market power in some airport markets, certain MS imposed some form of economic regulation in past years. However, economic regulation was not harmonised among MS. In some MS only the largest airports were subject to formal economic regulation (such as rate of return, price-cap or price monitoring). Among MS, airports were also characterised by different ownership arrangements and exposed to different degree of competition from nearby airports. Moreover, only some MS had already in place an independent sectoral supervisory authority before the transposition of the ACD.

While the ACD did not impose formal price economic regulation, it brought about a number of rules and principles aimed to create a common regulatory framework among MS and to increase the airlines countervailing bargaining power vis-à-vis airports. Of these principles, the most important ones are: i) the principle of non-discrimination among airlines; ii) the obligation to consult airlines before modifying the levels and the structure of charges and consulting the parties before the implementation of major investment programmes; iii) a greater transparency in the charges setting process.

These rules, together with the establishment of an independent supervisory authority, were expected to produce positive effects on the airport-airlines market increasing the bargaining power of airlines possibly leading to a reduction in airport charges, everything else being equal.[2]

This report aims to assess whether the introduction of the ACD had an effect on the level of airport charges. The study exploits the fact that the ACD applied to airports serving more than 5 million passengers. This feature allows comparing the average change in the level of charges before and after the introduction of the ACD for airports in the treatment group, i.e. airports that registered above 5 million passengers, to the average change in the level of charges for airports in the control group. Yet, in order to have a control group as comparable as possible to the treatment group, only airports that registered passengers between 2 and 5 million were factored in. Finally, since large airports are likely to differ from smaller ones in terms of market power, economies of scale and

[1] However, some authors have stressed that airports might have incentives not to exploit their possible market power. See Section 3.

[2] For example, if the ACD has led some airports to invest more in infrastructure or to increase the quality of service, this could have put some upwards pressure on the level of airport charges.

routes offered, notably with respect to long-haul intercontinental flights, only airports that registered less than 20 million passengers were included in the treatment group.

The study also investigates the impact of the ACD on this group of very large airports. Since there is not a natural control group for these airports within EU, Asian and American airports with similar number of passengers were considered.

Overall, findings can be summarised as follows:

- The ACD seems to have favoured a reduction in the level of charges by about 10% for airports in the treatment group but only in the case of flights within the EU of both the low cost and full-service airlines. This effect, which is weakly statistically relevant, materialised on average after three years following the adoption of the directive;
- In the case of the other two scenarios considered in the report, intercontinental flights (long-haul) of legacy airlines and regional flights, no statistically significant results associated to the introduction of the ACD have been detected;
- The ACD seems not to have affected charges for the largest airports. This result, to some extent, might reflect the fact that the control group of non-EU airports is probably too heterogeneous with respect to the EU sample in terms of institutions, legislation and economic regulation.

The remainder of the report is organised as follows. Section 2 briefly discusses the main provisions of the ACD and its implementation across MS. Section 3 reviews previous literature on the determinants of airport charges. Section 4 describes the data and Section 5 discusses the econometric approach. Section 6 presents the results and Section 7 concludes.

2 The Airport Charges Directive

The Directive 2009/12/EC was adopted on 11 March 2009 and transposed by MS into national legislations in the period 2011-14. The bulk of countries transposed in 2011-12. Table 1 shows the years of transposition for the 28 Member States, Norway and Switzerland.

The transposition year is taken from the EUR-LEX database. For some MS, several national acts can be associated with the transposition of the ACD. For example in Spain the first national law was passed in 2011 and the last in 2014. For these cases, the last implementation year is considered.

The transposition year as indicated in this report is solely for the purpose of this report. It does not provide any indication on the compliance of the transposition in a given MS with the ACD and does not prejudge any analysis by the Commission on the compliance of the national transposition with the ACD.[3]

The rationale for the adoption the ACD was to create a "a common framework regulating the essential features of airport charges and the way they are set" (Directive 2009/12/EC). This framework takes into account the guidelines of the Council of the International Civil Aviation Organization, which include the principles of non-discrimination, cost-relatedness and the establishment of an independent mechanism for the economic regulation of airports.

The ACD concerned the charging system of airports that register more than 5 million passengers per year and of the largest airport in a Member State.

Moreover, the ACD affected only a fraction of the overall charges that are commonly levied by airports within the EU. These are called in-scope charges. In particular, the ACD targeted the following charges:

- runaway & parking charges
- passenger charges
- infrastructure charges
- cargo charges
- noise charges

By way of contrast, the ACD did not concern charges related to en route and terminal air navigation services, passenger security, ground handling, and passengers with reduced mobility.[4]

The ACD required that the system of in-scope charges complies with the following features:

1. Non-discrimination. Airports cannot charge different prices for the same service and any differences associated to environmental and public interest reasons should be clearly motivated. Similarly, differentiated services can have different charges.
2. Consultation. The ACD introduced compulsory consultation between the airport operators and the airport users. The ACD required the airport operators to consult airport users on any proposed change of the level and structure of charges and to motivate such change (article 6). Most importantly, in the case of disagreement, airport users can bring the case to an independent supervisory authority which can adjudicate on the matter. Consultation is necessary when the airport operator plans to finalise new infrastructure projects or when service quality level agreements are negotiated between airports and airports.

[3] See Table 4 in Annex 1 for the transposition year considered in this Report
[4] For a detailed description of the charges not included in the ACD see Steer Davies Gleave (2013).

3. Transparency. Airport operators shall provide relevant information that can justify the level and structure of the charging system (article 7). Airport operators have to provide information on the methodology used to set charges, the overall cost structure with regard to the facilities and services, the revenue of the different charges and the total costs of the services covered by them, forecasts of the situation at the airport as regards charges, traffic growth and proposed investments, the actual use of airport infrastructures, etc.
4. Independent supervisory authority. MS are required to set up an independent supervisory authority (if not already in place), which is responsible of the application of the ACD in the MS.

These principles, if correctly applied, might engender an increase in the countervailing power of airlines vis-à-vis the airport operator, possibly leading to a reduction of the in-scope airport charges. This will be discussed thoroughly in Section 3.

The principle of non-discrimination, coupled with a more transparent establishment of a charging system, ensures equal treatment of airport users, independent of their individual bargaining power. This principle might lead to all airlines benefiting from lower charges negotiated by an airport user with higher degree of bargaining power (these are usually the largest airport users of a given airport or a low cost carrier).[5]

Implementation of the ACD was not uniform across MS, due to a number of reasons. On the one hand, some provisions of the ACD were already in place in some MS before the transposition of the ACD, as well documented by Steer Davies Gleave (2013). On the other hand, it must be recognized that not all MS fully complied with the requirements of the directive: indeed, since the transposition deadline the Commission has launched investigations or opened infringement procedures against some MS. These facts entail that that the effect of the ACD might be expected different for airports operating in these MS.

An increase in bargaining power of airlines might not necessarily result in a downward pressure on the level of charges. It could also lead to an increase in the level of services with no change in the level of airport charges. In addition, as the ACD allows investments in infrastructure to be financed by charges, if airports invest more in infrastructure, this could have put some upwards pressure on the level of airport charges.

[5] See the literature review in Section 3.

3 Previous literature on the determinants of airport charges

Several authors have discussed the complex relationship between the intensity of competition among airports, the existence of airline countervailing power, the role played by non-aviation revenues, and the level of airport charges.[6] Haskel *et al*. (2013) show that airports facing competition for most of its routes from other competitors (not under common ownership) that are located in its catchment area, are more likely to set lower aeronautical charges. Haskel *et al.* (2013) also show the importance of the vertical interactions between airports and airlines. In their model, stronger competition between airlines leads to lower aeronautical charges, because there are fewer rents to be extracted by the airport from the airlines.[7]

Moreover, some authors (e.g. Starkie, 2002) argue that the complementarity between the demand for aeronautical and commercial services might reduce the incentives of airports to exploit their market power. By keeping airport charges relatively low, airports might attract airlines and passengers, boosting their commercial revenues (D'Alfonso and Bracaglia, 2017). This can be particularly important in airports where the share of non-aeronautical revenue accounts for the majority of airport's revenue.

Where airlines have more countervailing bargaining power, airports have limited leeway to set high aeronautical charges. Yet, if few airlines operate in a given airport, the buyer power of airlines can be quite strong. As a matter of fact, airlines' threat to relocate can be highly credible so as to lead to lower charges.[8]

From this point of view, the principle of non-discrimination (which should force airports to "transfer" discounts enjoyed by airlines with buyer power to other carriers), the increased transparency in both the structure of charges and the formal process of consultation favoured by the ACD might result in an increase in airlines' countervailing bargaining power, and therefore lead to lower airport charges.[9]

Very few empirical studies analysed the impact of airline countervailing power on aeronautical charges. Moreover, the only existing studies report mixed evidence.[10] Van Dender (2007) and Choo (2014) do not find any statistically significant correlation between the levels of airport charges and carriers countervailing power in a sample of large US airports. Van Dender (2007) measures bargaining power by using an index of airlines concentration of each airport, while Choo (2014) considers the market share of the dominant airline. Empirical evidence for EU airports reports different results. In particular, by using a cross-section of 100 airports located in the EU and EEA countries and observed in 2007, Bel and Fageda (2010) find a negative and robust correlation between airlines countervailing power (measured by airport's Hirschman-Herfindal index of concentration based on the number of flights offered by the various airlines) and the level of airport charges. Similarly, for a panel of the largest 25 British airports observed

[6] See, for instance, Oum and Fu (2008) and Starkie (2002).

[7] Bottasso *et al.* (2017) report some very weak evidence consistent with this prediction.

[8] The countervailing buyer power is likely to be particularly strong in the case of airports dominated by low cost carriers (LCCs): indeed, LCCs tend to sink a lower share of their costs into a given airport and therefore their threats to relocate towards other nearby airports in response to increases in airport charges are more likely to be credible and, therefore, effective as a discipline device.

[9] However, in the model of Haskel et al (2013), the principle of non-discrimination leads to higher airport charges. This is because, in their model, the extension of any discount obtained in the bargaining process to other airlines might make each airline a less tough negotiator, because some of the benefits of the negotiation (i.e. lower charges) spill over to other airlines, and therefore are not internalized by a profit maximizing airline.

[10] For the role played by competition among airports, the evidence is rather scant. While Bel and Fageda (2010) and Bottasso et al. (2017) find that competition (proxied by the number of airports located within a radius of 100 km and by the Herfindal index of concentration in the airport's catchment area, respectively) exerts a negative effect on the level of airport charges, Van Dender (2007) and Bilotkach et al (2012) do not find any statistically significant effect. As far as the complementarity between aviation and commercial demand is concerned, Choo (2014) reports, for a panel of US airports, a negative correlation between the share of non-aeronautical revenue and charges. By way of contrast, Bilotkach et al (2012) for a panel of EU airports and Bottasso et al. (2017) for the UK case do not find a statistically significant relationship. See, for a brief summary of this literature, Bottasso et al (2017).

over the period 1996-2008, Bottasso *et al.* (2017) report a strong association between airlines buyer power (measured by the largest carrier's market share in the airport or in the catchment area of the airport) and lower aeronautical charges.

4 Estimation approach

This section describes the econometric approach used to estimate the impact of the ACD on the level of airport charges. The analysis relies on a differences-in-differences research design (diff-in-diff), where a "treatment" group of airports is contrasted to a control group of airports, before and after the implementation of the Directive. In particular, the analysis compares the average change in the level of charges before and after the introduction of the ACD for airports in the treatment group, i.e. airports that registered more than 5 million passengers, to the average change in the level of charges for airports in the control group, i.e. airport handling less than 5 million passengers. In order to have a control group as comparable as possible to the treatment group, only airports that registered passengers in the interval 2 to 5 million were factored in. Since large airports are likely to be different from small ones in terms of market power, economies of scale and routes offered notably with respect to long-haul intercontinental flights, the treatment group is comprised of airports that did not register more than 20 million passengers.

The present study estimates the following model:

$$lnC_{it} = \alpha_1 T_{it} + \alpha_2 Post_{it} + \alpha_3 (T_{it} * Post_{it}) + f_i + f_t + u_{it} \qquad (1)$$

where lnC_{it} is the natural logarithm of the level of airport charges in airport *i* in year *t*, T_{it} represents a binary variable equal to 1 for airports that in year *t* are above the 5 million threshold and for the largest airport in a country (if the 5 million threshold was not reached by any airport in that MS) and zero otherwise.[11] $Post_{it}$ is a binary variable that is equal to 1, for a given country, since the year of transposition of the ACD into national legislation and zero otherwise.[12]

Finally, f_i and f_t are airport and year fixed effects, respectively. f_t are meant to capture unobserved determinants of charges common to all airports, such as EU demand for aviation services. Likewise, f_i controls for any time invariant unobserved factors (e.g. existence of price regulation in a given airport, broad scale differences, degree of competition in their catchment areas, institutions in the local area where the airport is located, levels of corruption, long run efficiency of each airport, presence of competing airports in their catchment area) that might have driven airport charges. The inclusion of airport fixed effects makes the treatment and control groups more comparable.[13]

The coefficient α_3 of the interaction term, $T_{it} * Post_{it}$, represents the diff-in-diff estimate of the ACD on airport charges. It captures the average differential level of charges of treated airports as compared to control airports, after the transposition of the ACD.

The ACD provision, such as agreement upon new charges and the establishment of the national supervisory authority required time to be implemented and thus there are reasons to believe that the effect of the ACD needed time to materialize too.[14]

For this reason, an additional model which is able to identify year-by-year effects of the ACD is estimated as follows:

[11] Very few airports that were below the 5 million threshold at the beginning of the sample period have exceeded it over the period considered in this study, and this has usually occurred before the transposition of the ACD in the corresponding country. Results are robust to the exclusion of these airports from the sample.
[12] For instance, Italy transposed in 2012. In equation 1 the variable Post takes on the value of one for Italian airports in all years from 2012 onwards.
[13] The airport fixed effects control also for cases where provisions of ACD were already in place in given MS.
[14] Moreover, if a country transposed at the end of a given year T (say, in September), it is difficult for the ACD to display its effects in the implementation year.

$$lnC_{it} = \alpha_1 T_{it} + \alpha_2 Post_{it} + \beta_j \sum_{j=-1}^{3} (T_{it} * Post_{it+j}) + f_i + f_t + u_{it} \quad (2)$$

where, $Post_{it+j}$ takes on the value of 1 in year *t+j*, and 0 otherwise. This specification allows the ACD to have a differential effect over time. In particular, it is possible to compute the effect on the implementation year (j=0), one year after, two years after and after three years onwards (these are the terms within the summation operator in equation 1). For instance, the β_0 and β_1 estimate the average effect on airport charges on the year of implementation and in the subsequent year. The same reasoning occurs for the parameter β_2, which captures the impact on airport charges two years after the implementation. Finally, the parameter β_3 accounts for the effects after three years since the implementation and can be interpreted as the long-run effect of the ACD on airport charges.

Moreover, model (2) controls for anticipatory effects of the ACD. This is captured by the parameter β_{-1}. Were this coefficient significant, it would imply parties anticipated the adoption of the ACD and started to act accordingly, by varying the level of charges beforehand. Yet, a significant coefficient might indicate the presence of differential trend in airport charges between the group of treated airports and control airports in the period before the implementation of the Directive. This would make it difficult to understand whether the difference in charges after the adoption of ACD is due to this different time trend between the two groups or be the result of the Directive itself.[15]

To cope with the possible presence of serial correlation in airports at MS level, the models (1)-(2) use robust standard errors clustered at the country level. To take into account the different airports size the models are estimated by weighting the observation by the number of the passengers.

4.1 The international sample

In order to extend the analysis to the largest EU airports, namely those with more than 20 million passengers, it is necessary to have a control group of airports as comparable as possible to the treated ones. This implies to use information of Asian and American airports that served more than 20 million passengers.

The present study estimates the following model:

$$lnC_{it} = \gamma_1 T_{it} + \gamma_2 Post_{it} + \gamma_3 (T_{it} * Post_{it}) + f_i + f_t + u_{it} \quad (3)$$

where T_{it} takes on the value of one for EU airports and 0 for non-EU airports; $Post_{it}$ is a binary variable which equals one for the period after an EU country transposed the Directive and zero for the period before the transposition. f_i and f_t are the airport and year fixed effects respectively, while u_{it} is the error term. This model has been estimated considering only scenario 2, namely the one that includes long-haul intercontinental flights. This choice is driven by the fact that this type of flight is likely to be the most relevant one for the international comparison.

A concern associated to this model is that the control group belongs to institutional environments which can be very different from the EU one and possibly subject to different economic conditions, business cycles and different legislation. Model (3) attempts to take this into account by including airport and time fixed effects. However, this could not suffice and hence results should be taken with caution.

[15] A key assumption of the difference-in-differences estimator is that changes in outcome variable for the treatment and control groups follow a parallel trend. This assumption is known as the parallel trend assumption. A failure of this might either overstate or understate the effect of the policy.

5 Data

Data on airports charges were taken from airportcharges.com provided by RDC aviation. The database contains detailed information on different types of charges for worldwide airports. Data used for the present analysis refers to airport charges as of the June, 1 of each year.

Airport charges vary accordingly to a number of factors such as size of the aircraft, number of passengers, flights schedule, parking time and other flight characteristics together with the types of services used at the airport. There is no unique measure to use for the analysis. The present study followed Steer Davies Gleave's report (2017) and considered four scenarios, wherein the relevant charges are computed. The first scenario considered the costs for short-haul EU flights of legacy (full service) airlines. The second scenario included the costs of intercontinental flights (long-haul) of legacy airlines. The third scenario took into account EU flights provided by low-cost carriers. The fourth scenario considered the costs of regional flights. Table 2 displays the main characteristics of the four scenarios.

Table 1. Turnaround scenarios for airport charges

	Scenario 1 Short-haul Full service carrier	**Scenario 2 Long-haul Full service carrier**	**Scenario 3 Short-haul Low cost carrier**	**Scenario 4 Regional Regional carrier**
Aircraft	A320	B777-200	B737-800	DHC 8-400
MTOW	74,00	247,00	79,00	27,00
Passengers	132	143	170	51
Transfer passenger	26	77	0	10
Load factor	81,00	80,00	90,00	65,00
Capacity	162	179	189	78
Season	Summer	Summer	Summer	Summer
Arrival Time	07:30	05:00	10:00	07:30
Parking Time	00:45	03:45	00:25	00:35

The study considered data for EU airports that registered more than 2 million passengers in at least one year over the period 2008-16.

As for models (1) and (2), the treatment group comprised of EU airports that handled 5 to 20 million passengers. The control group is made up of EU airports that registered 2 to 5 million passengers over the sample period. According to the data, very few airports that were below the 5 million threshold in 2008 registered more passengers in the subsequent years. This usually occurred before the transposition of the ACD. The final sample consists of 79 treated airports and 57 airports in the control group. Table 5 in the Annex lists the airports in the treatment and control groups.

The "international" sample included only the largest EU, North American and Asian airports, i.e. the ones that registered more than 20 million passengers. These amounted to 73 airports of which 24 where EU (i.e. treated). The full list of the airports in the "international" sample is presented in Table 6 in the Annex.

Airport charges include a number of charges levied by airports for the use of their infrastructure, as well as taxes and other charges collected on behalf of third-party providers or public authorities. The ACD concerned a subset of these charges. Among these, the RDC aviation database provides information only on the following in-scope charges: runaways' charges, parking charges, passenger charges, infrastructure charges, and noise charges.[16]

As for robustness checks, the analysis considered charges that are out of the scope of the ACD. These (not-in-scope) charges are the following: en route and terminal air navigation charges services, passenger security charges, government charges, aircraft security charges, and customer charges.[17]

Table 3 shows the mean values and the standard deviations of the deflated charges for each turnaround scenario as well as the number of airport passengers. These are computed for the overall sample and for the treated and control airports. Descriptive statistics are reported for the overall time period and for three specific years: 2008, 2012, 2016. As it regards the whole sample, there has been an increase in the number of passengers and in the level of in-scope charges throughout the period 2008-16. This increasing trend is also confirmed in the sub-groups, even though treated airports exhibit on average a higher level of in-scope charges than airports in the control group.

[16] Cargo charges in the dataset had only missing or zero values and, thus, were not considered.

[17] The charges are all expressed in euro and deflated by the Harmonised Index of Consumer Price and the Consumer Price Index (CPI) for the EU sample and the international sample, respectively.

6 Results

Table 4 presents the main findings for the four turnaround scenarios. Column 1 reports, for each scenario, the estimated coefficients for the model (1), while the second column provides the estimates of the model (2). Column (3) displays estimates for the model (2), while including estimates for anticipatory effects.

Results for the specification (1) indicate that the introduction of the ACD triggered a reduction of the level of charges. Nevertheless, the estimated effects are not statistically different from zero for all scenarios.

As regards the model (2), results suggest that charges were lowered three years, or more, after the ACD was transposed. This effect is weakly statistically significant at the conventional level for EU flights of legacy carriers and for EU low-cost flights (scenario 1 and 3, respectively). In particular, in the first scenario the directive is associated to a decrease in the airport charges by approximately 10%. Similarly, in the third scenario, the ACD led to a negative and significant decline of airport charges of 10.7%.

Given that the mean value of the in-scope charges for scenario 1 (3) was about 2,600 (3,300) euro,[18] what these estimates simply suggest is that ACD led to a reduction in the airport charges of about 260 (330) euros.

As for scenarios 2 and 4, the coefficients associated to the introduction of the ACD are negative, albeit not statistically significant, so that it is not possible to reject the null hypothesis that the effect of the ACD was indeed zero for this type of charges.

The results for scenario 2 however are not surprising, since airports of the control group were less likely to be connection nodes for long haul (intercontinental) flights as the airports in the treated group. Therefore this set of charges may not be fully representative of charges really levied to airport users by those airports.

Analogously, the not statistically significant results for scenarios 4 are possibly due to the fact that airports with more than 5 million passengers are less likely to offer regional flights. Figure 1 corroborates this assumption by showing that the share of passengers carried in regional-type-aircrafts in the period 2008-15 over total passengers was very small and decreased over time.

To check the possibility that there were anticipatory responses by airports in setting charges, columns 3 of all scenarios include the variable *1 year before.* Had this been the case, the estimated coefficient of this variable would have been negative and statistically significant from zero. Table 4 suggests that anticipatory effects are not relevant for all scenarios.

Airport fixed effects control for any unobserved time-invariant differences between treated and control airports, that could possibly drive the effect of the ACD. Yet, the airport fixed effects should largely capture airport size differentials. However, different airports might have experienced changes in the number of passengers over time. In order to control for the possibility that the number of passengers changed differentially between the treatment and the control group, an additional model that included the polynomial of order 3 of the number of passengers was estimated. Results of such exercise, not shown in the present report, are consistent with those of Table 4.

To check the robustness of results, similar models to those reported in Table 4 have been estimated by using not-in-scope charges, which are outside the scope of the ACD by definition. Therefore, one should not expect to find any statistically significant effects associated to the ACD on this category of charges. The results, not shown here but available upon request, are not statistically significant for any scenarios.[19] These findings

[18] This corresponded to the average value of in-scope charges in the case of treated airports in 2016.

[19] Moreover, there is no statistically significant difference between countries that received and that did not receive a legal notice on the transposition of the ACD.

provide two insights. Firstly, the positive estimated coefficients represent a validation of the main results for in-scope charges, because they suggest that the reduction of in-scope charges observed for treated airports after the transposition of the ACD is not due to possible unobserved shocks, unrelated to the ACD, that have determined an overall decreasing pattern on all categories of charges (in scope and not in scope) in the case of treated airports. Secondly, the positive (but not significant coefficients) might suggest that there could have been some degree of rebalancing in the charges mix in treated airports.

What all the results seem to point out is that within the European sample there is evidence that the ACD might have had an impact, albeit modest, on in-scope charges. These effects are more marked for low-cost carriers and for the EU level flights of full service airlines, and it took some years to materialize.

As far as the international sample is concerned, where the biggest European airports have been benchmarked with the biggest North American and Asian ones, the analysis mainly focused on scenario 2 (long-haul intercontinental flight), which is likely to be the most relevant for this sample. In this case, the introduction of the ACD was associated to a higher level of charges in the EU airports with respect to their American and Asian peers. However, this result must be interpreted with caution. Indeed, in the specification with year-by-year effects a positive and statistically significant anticipatory effect was found, which points to a clear evidence that EU and non-EU airports might have been on different trends, possibly invalidating the parallel trend assumption[20].

[20] Probably, the violation of the parallel trend assumption is due to the significant heterogeneity characterising airports in this sample. Indeed, in order to make the parallel trend assumption more likely to be respected, a set of airport linear time trends have been included. In this case, findings indicate that ACD was associated to a reduction in airport charges, although noisily estimated.

Table 2- Summary statistics (European sample)

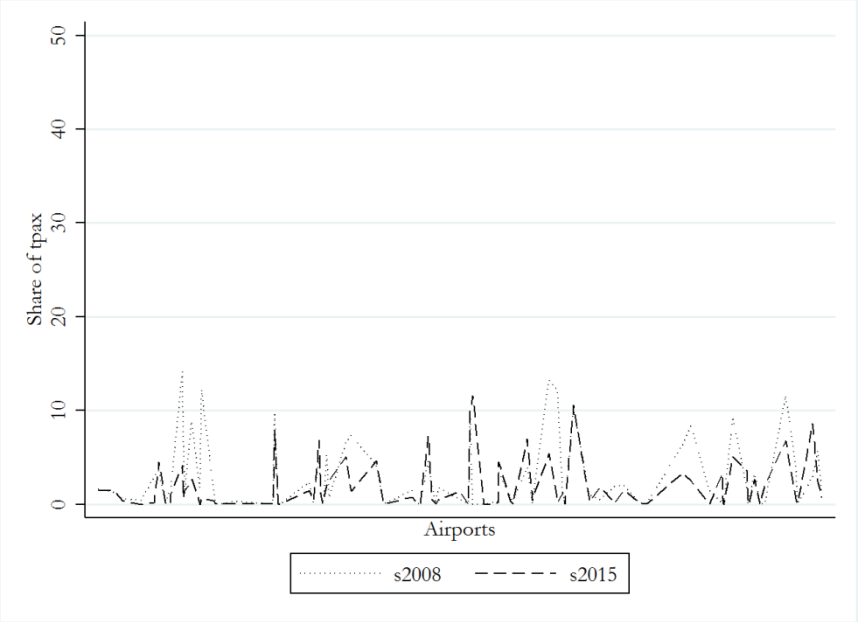
	Whole sample				Treated airports				Non-treated airports			
	Mean	2008	2012	2016	Mean	2008	2012	2016	Mean	2008	2012	2016
In-scope charges-Scenario 1	2376.92	2206.10	2343.42	2532.07	2508.74	2403.09	2472.62	2592.53	2223.09	1974.71	2196.04	2449.72
s.d.	*1186.54*	*1096.33*	*1205.99*	*1176.29*	*1087.64*	*981.38*	*1100.24*	*1090.80*	*1276.27*	*1183.98*	*1309.51*	*1288.86*
In-scope charges-Scenario 2	4415.45	4239.57	4371.60	4613.20	4596.73	4594.06	4566.23	4670.00	4203.91	3823.18	4149.61	4535.85
s.d.	*2311.44*	*2122.64*	*2142.31*	*2214.92*	*1997.74*	*2126.35*	*1963.16*	*1972.70*	*2616.64*	*2057.55*	*2325.72*	*2523.78*
In-scope charges-Scenario 3	2971.83	2738.90	2928.27	3198.54	3161.46	3014.79	3113.64	3288.56	2750.54	2414.84	2716.85	3075.92
s.d.	*1511.41*	*1413.93*	*1537.88*	*1505.49*	*1426.12*	*1334.58*	*1430.48*	*1452.25*	*1577.89*	*1445.92*	*1637.60*	*1579.63*
In-scope charges-Scenario 4	960.73	889.64	957.40	1024.73	1037.40	980.93	1045.00	1072.01	871.26	782.42	857.47	960.33
s.d.	*529.61*	*462.30*	*544.87*	*515.67*	*528.05*	*413.47*	*570.57*	*497.38*	*517.69*	*495.87*	*499.81*	*537.23*
Passengers	9384991	9043494	9344267	10500000	14900000	14300000	14900000	15900000	2968512	2838537	2965263	3072031
s.d.	*12100000*	*11700000*	*12100000*	*13300000*	*14400000*	*13900000*	*14500000*	*15300000*	*1099365*	*1053303*	*1121554*	*1114799*

Table 3- Main results of the impact of ACD on the level of airport charges.

	Scenario 1			Scenario 2			Scenario 3			Scenario 4		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
$T_{it} * Post_{it}$	-0.0425			-0.0728			-0.0458			-0.0382		
	(0.347)			(0.233)			(0.306)			(0.356)		
Implementation		0.0134	0.0148		-0.0290	-0.0275		0.00814	0.0112		-0.0161	-0.0148
		(0.740)	(0.740)		(0.405)	(0.487)		(0.837)	(0.794)		(0.575)	(0.664)
1 Year after		-0.00138	0.000173		-0.0483	-0.0467		0.0132	0.0165		-0.0110	-0.00965
		(0.976)	(0.997)		(0.410)	(0.453)		(0.776)	(0.750)		(0.797)	(0.841)
2 Years after		-0.0343	-0.0327		-0.0858	-0.0841		-0.0474	-0.0439		-0.0406	-0.0391
		(0.454)	(0.532)		(0.168)	(0.208)		(0.315)	(0.413)		(0.411)	(0.478)
3 Years (+) after		-0.100*	-0.0983		-0.103	-0.101		-0.107*	-0.103		-0.0637	-0.0621
		(0.0819)	(0.128)		(0.203)	(0.242)		(0.0724)	(0.121)		(0.199)	(0.275)
1 Year before			0.00580			0.00605			0.0122			0.00522
			(0.843)			(0.839)			(0.679)			(0.855)
Observations	1,017	1,017	1,017	1,017	1,017	1,017	1,017	1,017	1,017	1,017	1,017	1,017
Implementation + 1 Y after + 2 Y after + 3 Y+ after = 0		0.0371	0.0467		0.2691	0.2930		0.0200	0.0287		0.3356	0.3788

*** p<0.01, ** p<0.05, * p<0.1 Robust p-values in parentheses, SE (not reported) clustered at country level. All regressions include a set of airport fixed effects, year effects and T_{it} and $Post_{it}$ dummies.

Figure 1- Share of regional flights passengers over total passengers in European airports (2008, 2015)



7 Conclusions

This report provided an empirical evaluation of the effect of the Airport Charges Directive on the levels of airport charges using a difference-in-differences estimator that allows disentangling the causal effect of the ACD from underlying trends and other factors affecting the airport industry.

The analysis was mainly focused on the case of airports between 2 and 20 million passengers. Such a restriction allows exploiting one feature of the ACD, namely that it applies only to airports with more than five million passengers. The airports in the 2-5 million passenger category can therefore act as a control group for the largest airports.

Airports with more than 20 million passengers have been excluded, because they are likely to be structurally different along a set of dimensions and therefore not directly amenable for a comparison with their smaller counterparts.

In the report, for each airport and year, four kinds of turnaround scenario have been defined, and these are broadly representative of airport charges paid, respectively, by low cost airlines for within EU flights, full service airlines for within EU flights, full service airlines for long-haul intercontinental flights and regional flights with small aircrafts.

Results on regressions carried out in the main sample, namely the 2-20 million sample of EU airports, show a significant negative effect of the ACD on the level of charges of about 10 per cent after at least three years following transposition into national legislation. This result holds in the case of the within EU flights of both the low-cost and full-service airlines. In the case of the other two scenarios, the estimates, though negative, are smaller and less precise.

It must be recognized that intercontinental long-haul flights are probably not very common in most of the airports considered in this analysis (and surely for the control group below the 5 million threshold). Moreover, the fourth scenario relates to regional flights with small aircrafts, which might be not very important in terms of passengers moved.

Hence, all in all, it seems reasonable to conclude that the introduction of the ACD might have been associated to a reduction in the level of charges, quantified in about 260-330 euro per flight after at least three years following implementation.

Finally, for the largest airports above 20 million passengers, the empirical results do not provide clear-cut evidence on the impact of the ACD. Whether this is due to possible limitations of the ACD in the case of larger airports or to the strong heterogeneity characterizing EU and non-EU airports in terms of institutions, legislation and economic regulation, is not clear.

8 Annex 1

Table 4: Transposition of the Airport Charges Directive

Country	
Austria	2012
Belgium	2011
Bulgaria	2011
Cyprus[21]	-
Czech Republic	2011
Croatia	2013
Denmark	2011
Estonia	2011
Finland	2011
France	2012
Germany	2012
Greece	2012
Hungary	2011
Ireland	2011
Italy	2012
Latvia	2011
Lithuania	2011
Luxembourg	2012
Malta	2011
Netherlands	2011
Norway	2012
Poland	2013
Portugal	2012
Romania	2011
Slovenia	2011
Slovakia	2011
Spain	2014
Sweden	2011
United Kingdom	2011
Switzerland	2012
Iceland	2012

[21] Transposition year for Cyprus is not reported because the only airport considered (Larnaka airport), although covered by the ACD (being the largest airport in the country), had charges fixed for 25 years under the BOT (Build-Operate-Transfer) agreement signed in 2006 by the Cypriot Government with a private operator. For this reason we have included Larnaka airport into the control group throughout the sample period.

Table 5- List of the airports in the treatment and control groups

Treated group		Control group		Switchers		
Code		Code		Code		year
AGP	Malaga	ABZ	Aberdeen	ACE	Lanzarote	2011
ALC	Alicante	BBU	Bucharest - Baneasa	BGO	Bergen - Flesland	2011
AMS	Amsterdam - Schiphol	BDS	Brindisi - Papola Casale	BOD	Bordeaux	2015
ARN	Stockholm - Arlanda	BFS	Belfast International	CIA	Rome - Ciampino	2015
ATH	Athens - Eleftherios	BHD	Belfast City	GOT	Gothenburg - Landvetter	2013
BCN	Barcelona	BIO	Bilbao	HAJ	Hanover	2011
BGY	Milan - Orio Al Serio	BLL	Billund	HER	Heraklion - N. Kazantzakis	2011
BHX	Birmingham International	BMA	Stockholm - Bromma	MLH	Euro Basel-Mulhouse-Freiburg	2013
BLQ	Bologna - Guglielmo Marconi	BOJ	Bourgas	OTP	Bucharest – H.C.	2011
BRS	Bristol	BRE	Bremen	SKG	Thessaloniki International	2014
BRU	Brussels - National	BRI	Bari - Palese	VLC	Valencia	2015
BTS	Bratislava	BVA	Paris - Beauvais-Tille			
BUD	Budapest - Ferihegy	CAG	Cagliari - Elmas			
CDG	Paris - Charles De Gaulle	CFU	Kerkyra - I. Kapodistrias			
CGN	Cologne Bonn	CHQ	Chania International			
CPH	Copenhagen	CWL	Cardiff			
CRL	Brussels South Charleroi	DTM	Dortmund			
CTA	Catania - Fontanarossa	EIN	Eindhoven			
DUB	Dublin	EMA	East Midlands			
DUS	Dusseldorf	FLR	Florence - Peretola			
EDI	Edinburgh	FNC	Madeira			
FAO	Faro	FUE	Fuerteventura			
FCO	Rome - Fiumicino	GDN	Gdansk Lech Walesa			
FRA	Frankfurt International	GRO	Gerona - Costa Brava			
GLA	Glasgow International	HHN	Frankfurt - Hahn			
GVA	Geneva - Cointrin	KGS	Kos			
HAM	Hamburg	KRK	Krakow-Balice			
HEL	Helsinki-Vantaa	KTW	Katowice International			
IBZ	Ibiza	LBA	Leeds/Bradford			
KEF	Reykjavik - Keflavik	LCA	Larnaca			
LGW	London - Gatwick	LCY	London City			
LHR	London - Heathrow	LEJ	Leipzig/Halle			
LIN	Milan - Linate	MAH	Menorca			
LIS	Lisbon	MMX	Malmo - Sturup			
LJU	Ljubljana Jože Pucnik	NCL	Newcastle			
LPA	Las Palmas - De Gran Canaria	NRN	Dusseldorf - Niederrhein			
LPL	Liverpool John Lennon	NTE	Nantes Atlantique			
LTN	London - Luton	NUE	Nuremberg			
LUX	Luxembourg	NYO	Stockholm - Skavsta			
LYS	Lyon - Saint Exupery	OLB	Olbia - Costa Smeralda			
MAD	Madrid - Barajas	ORK	Cork			
MAN	Manchester International	PFO	Paphos International			
MLA	Malta International	PIK	Glasgow Prestwick			

MRS	Marseille	PMO	Palermo - Punta Raisi
MUC	Munich - Franz Josef Strauss	PSA	Pisa - Galileo Galilei
MXP	Milan - Malpensa	RHO	Rhodes International
NAP	Naples	SCQ	Santiago De Compostela
NCE	Nice - Cote D'Azur	SNN	Shannon
OPO	Porto	SUF	Lamezia Terme
ORY	Paris - Orly	SVG	Stavanger - Sola
OSL	Oslo	SVQ	Sevilla - San Pablo
PMI	Palma Mallorca	TFS	Tenerife South
PRG	Prague - Ruzyne	TRD	Trondheim - Vaernes
RIX	Riga	TRN	Turin - Caselle
SOF	Sofia	TSF	Venice - Treviso
STN	London - Stansted	VRN	Verona
STR	Stuttgart	WRO	Wroclaw Copernicus
SXF	Berlin - Schoenefeld		
TFN	Tenerife North		
TLL	Tallinn - Ulemiste		
TLS	Toulouse - Blagnac		
TXL	Berlin - Tegel		
VCE	Venice - Marco Polo		
VIE	Vienna International		
VNO	Vilnius International		
WAW	Warsaw - Frederic Chopin		
ZAG	Zagreb		
ZRH	Zurich		

Treated group - airports with more than 5 million passengers (2010); Control group- airports with more than 2 million but less than 5 million passengers (2010); Switchers- airports that became treated throughout the period analysed.

Table 6- List of the airports in the treatment and control groups in the international sample

EU airports with more than 20 million passengers		Top Asian and North American airports	
Code		Code	
AMS	Amsterdam - Schiphol	ATL	Hartsfield-Jackson Atlanta International
ARN	Stockholm - Arlanda	BKK	Bangkok - Suvarnabhumi International
BCN	Barcelona	BOM	Mumbai
BRU	Brussels - National	BOS	Boston - Logan International
CDG	Paris - Charles De Gaulle	BWI	Baltimore/Washington International T. M.
CPH	Copenhagen	CAN	Guangzhou - Baiyun
DUB	Dublin	CGK	Jakarta - Soekarno-Hatta International
DUS	Dusseldorf	CLT	Charlotte - Douglas
FCO	Rome - Fiumicino	CTU	Chengdu
FRA	Frankfurt International	DEL	Delhi - Indira Gandhi International
LGW	London - Gatwick	DEN	Denver International
LHR	London - Heathrow	DFW	Dallas/Ft. Worth International
LIS	Lisbon	DTW	Detroit - Wayne County
MAD	Madrid - Barajas	DXB	Dubai
MAN	Manchester International	EWR	New York - Newark Liberty International
MUC	Munich - Franz Josef Strauss	FLL	Fort Lauderdale-Hollywood International
MXP	Milan - Malpensa	GRU	Sao Paulo - Guarulhos International
ORY	Paris - Orly	HKG	Hong Kong International
OSL	Oslo	HND	Tokyo - Haneda
PMI	Palma Mallorca	IAD	Washington - Dulles International
STN	London - Stansted	IAH	Houston - George Bush Intercontinental
TXL	Berlin - Tegel	ICN	Seoul - Incheon International
VIE	Vienna International	IST	Istanbul - Ataturk
ZRH	Zurich	JFK	New York - John F. Kennedy International
		KMG	Kunming
		KUL	Kuala Lumpur International
		LAS	Las Vegas - McCarran International
		LAX	Los Angeles International
		LGA	New York - La Guardia
		MCO	Orlando International
		MEX	Mexico City - Juarez International
		MIA	Miami International
		MNL	Manila - Ninoy Aquino International
		MSP	Minneapolis - St Paul International
		NRT	Tokyo - Narita
		ORD	Chicago - O'Hare International
		PEK	Beijing - Capital
		PHL	Philadelphia International
		PHX	Phoenix - Sky Harbor International
		PVG	Shanghai - Pu Dong
		SEA	Seattle/Tacoma International
		SFO	San Francisco International

SHA	Shanghai - Hongqiao
SIN	Singapore - Changi
SLC	Salt Lake City International
SYD	Sydney - Kingsford Smith
SZX	Shenzhen
TPE	Taipei - Taiwan Taoyuan International
YYZ	Toronto - Pearson International

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List of abbreviations and definitions

ACD Charges Directive

EU European Union

MS Member States

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