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Full Length Research Paper

Differential meaning of the Spanish urban centres in the transport network through the demographic potential of the airports

***Roberto Díez Pisonero, Juan Córdoba Ordóñez and Cándida Gago García**

Complutense University of Madrid, Ciudad Universitaria, 28040 – Madrid, Spain

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The Spanish airport reality is characterized by two important phenomenons: the outstanding number of airports in the air national network and the tremendous disparity between all of them are more than 200 million passengers who use them, are distributed unevenly. If the demographic variable is added to these and, consequently, the relationship that exists in every airport between the number of passengers who use it and the demographic volume that it supplies, we observe that the network and air Spanish hierarchy is deeply distorted to the network and urban hierarchy. The following article tries to analyze, through Spearman's correlation analysis, the differential meaning of the Spanish centres in the transport network across the demographic potential of the airports. Following the specialising literature, the interest of this paper lies in clarifying the factors that are affecting to intensify these contrasts in Spain derived from the liberalization process of air transport as well as suggesting corrective measures to mitigate this situation.

Keywords: Airport hierarchy, Air transport, demographic potential, urban hierarchy.

INTRODUCTION

The mobility is one of the most relevant characteristics of the advanced societies (Taylor, 2004). Even though from the beginning of its existence, the human being walks and moves, it has been the increase of the population, the development of the tourist sector, the reorganization of the productive processes, the increasing volume of commercial exchanges and the dispersed settlement of the urban peripheries what explain the bigger movements of people and goods which have been registered for the last years to any scale analysis.

The world we are living in, inserted into the globalization, is an interconnected reality. If Internet and the TIC have had a decisive influence in the globalized trends, we cannot forget the important contributions that the modern transport systems and, very specially, the aviation sector, are playing in this contemporary globalization. Numerous authors have recognized the role of the air transport in the temporary space understanding that it characterizes to the current world and, with it, its protagonism as agent of globalization (Harvey, 1998; Derudder and Witlox, 2005; Derudder, 2006).

The air transport, even though it has not abolished the distances, has reduced drastically the time to save them "allowing not only the perception, but also the materialization of a world that is shrunk: both in the physical accessibility and in the most complex perspective of the cultural hybridization" (Cordoba et al., 2008). That is the reason why some authors speak about the "plasticity of the space" (Gago, 1998), capacity for which the world might stretch or shrink depending on the technological development of the transportation modes and electronic communications existing in every moment.

Disparity of the Spanish airports

Air traffic, as well as maritime, unlike the road and railway, does not need a fixed network of infrastructures to carry out the displacements. Nevertheless, it needs a few own facilities that are the identity sign of the air transport: the airports. Nowadays, the airport is one of the most complex and dynamic transport stations as consequence of the importance that air transport gene-

*Corresponding Author E-mail: rdpisonero@ghis.ucm.es

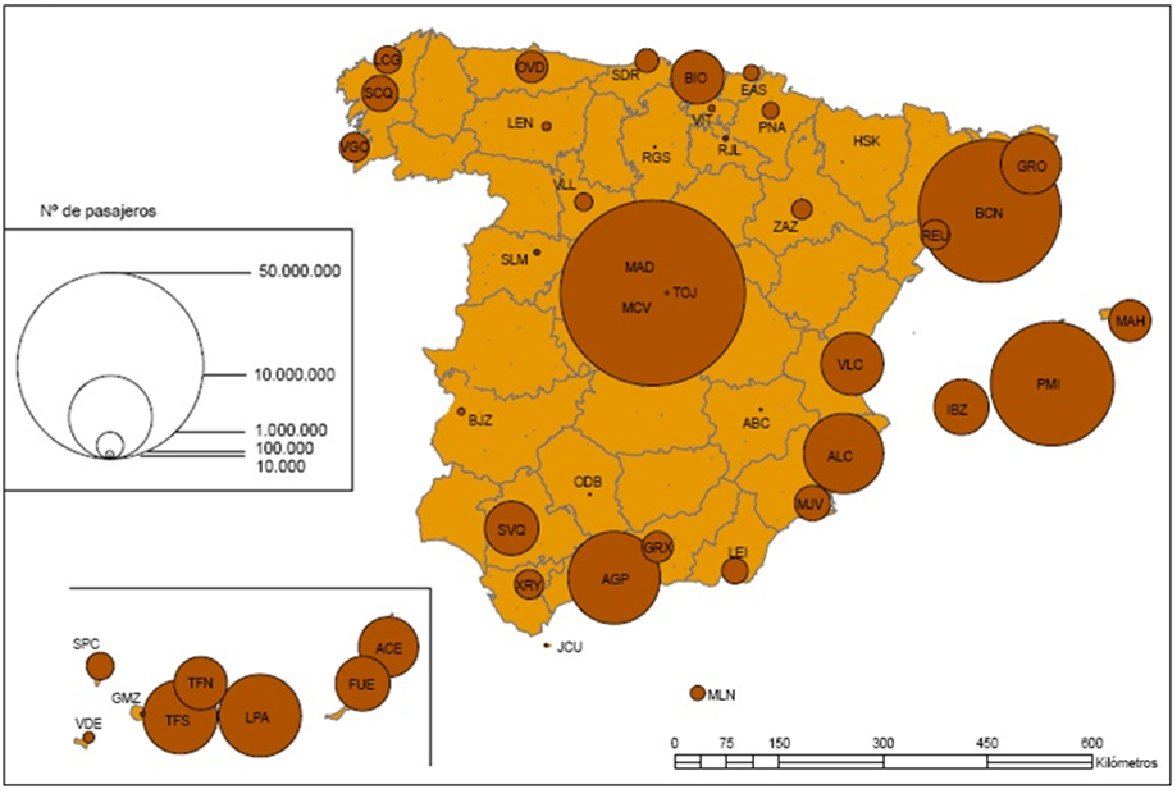

Figure 1. Spanish air hierarchy (Number of passengers, 2010) (IATA airport codes)
Source: Own Elaboration

rates in our current lifestyle.

The meaning of these places, especially of more important ones, has evolved in a few years, so from simple infrastructures to facilitate the aeronautical operations (landing, takeoff and other minimal needed services); they have transformed in big terminals like airport cities, where all kinds of services are concentrated; with functions not only tied with the air transport, but complementary and auxiliary to it (Kasarda and Lindsay, 2011). That is, we have evolved from the airport as an isolated point in the territory to the relational airport, not only with others transport infrastructures but also with other airport facilities.

But, why are these infrastructures of current importance? In this globalized world in which we are inserted in, airports recover an essential function to materialize the own interconnectivity of the contemporary globalization: to connect territories with the rest of the world in a direct way. Therefore, it is considered that an infrastructure of these characteristics allow to provide the regions where they are situated of prestige, reputation, centrality, functionality and internationalization (Díez, 2010).

The Spanish airport reality is characterized by two important facts: first, the high numbers of airports in the Spanish network and, at the same time, the tremendous disparity between all of them, so more than 200 million passengers who use them, are distributed unevenly.

If establishing a rank or hierarchy, there are a lot of parameters that might be used but, in this case, the number of passengers assessed in every airport is used as statistical variable. Probably it is not the most representative element, but "its simplicity and clarity justify its utilization" (Cattan, 1991), permitting to be nearer to the Spanish airport reality.

At present, only 3 out of 48 airports that AENA (Spanish Airports and Air Navigation) manages agglutinate more than half of the passengers' traffic that used these Spanish infrastructures (50.1 %). The percentage ascends up to the three fourths of the total (74 %) if we take into consideration the first eight airports. The rest (26%) is distributed in 39 remaining airports.(Figure 1)

This reflects the strong existing imbalances in this airport network (Serrano, 1994) since the dynamism that few of them recover contrast with the almost marginal role of a great majority, which originates notable management and planning problems. As consequence of this dilemma, a limited number of airports might be considered of general interest (because of its traffic volume, location, activity and strategic position).

The rest do not play a governing function in the national and international orbit; hence, the epithet of the second and third level infrastructures. They do not

Table 1. European air hierarchy (Number of passengers, 2010).

Rank	Airport	Nº Pax
1	London Heathrow	67,056,379
2	Paris-Charles de Gaulle	60,874,681
3	Frankfurt	53,467,450
4	*Madrid-Barajas*	50,846,104
5	Amsterdam Schiphol	47,429,741
6	Leonardo da Vinci-Fiumicino Rome	35,132,879
7	Munich	34,530,593
8	London Gatwick	34,214,474
9	*Barcelona El Prat*	30,208,134
10	Atatürk International	28,553,132
11	Paris-Orly	26,209,703
12	Dublin	23,500,000
13	*Palma de Mallorca*	22,832,865
14	London Stansted	22,360,364
15	Zürich	22,100,000

Source: Eurostat

register a significant quantitative role. Nevertheless, they play a very important function to regional scale, contributing to make more complex, denser and more intense airport network.

This disparity materializes even in the European airport hierarchy, since only three Spanish airport facilities are included in the top fifteen of the old continent. A number that ascends up to 15 equipments if we consider the 100 first ones of Europe.(Table 1)

Demographic potential of the airports: Relation population-passengers

With this airport panorama, it is our aim to analyze the differential meaning of the Spanish centres in the transport network through the demographic potential of the airports, that is, the relation that exists in every airport between the number of passengers who use it and the demographic volume that it supplies. The goal is to clarify the factors that are affecting to intensify these contrasts in Spain derived from the liberalization process of air transport as well as suggesting corrective measures to mitigate this situation.

METHODOLOGY

Before initiating the explanation, it suits to clarify a range of methodological nuances in four aspects: the selected dates, the demographic volume considered, the airports considered, and the statistical technology used for obtaining the results.

First, the years considered to obtain the results were 1970 and 2010. That period of forty years is sufficient to reveal the most important changes happened in the Spanish air panorama alter liberalization process of air transport.

Regarding the volume of population, different demographic scales appeared. Concretely, the municipal area (Municipal area: it includes the population of the principal city to the one that serves. For the archipelagoes, exempting the capitals of province, it is considered the principal municipality of the island), metropolitan area and metropolitan airport area were studied (Appendix 1). But, finally, the last entity was chosen in consideration for offering a few results more fitted with the reality.

As regards the airports, a series of infrastructures have been discarded for diverse reasons, both in 1970 and 2010.

Finally, for obtaining of the results, the methodology used by the authors Córdoba and Gago (2010) will be in use in the airport analysis that they carry out for Latin America, that is, the analysis of Spearman's correlation. The decision to select this method has not been at random, but it has answered to a long process of discussion.

At the beginning, it was considered to relate both variables through the coefficient of determination (R^2), with the cloud of points as representation. Thus, the level of variation of the dependent variable (passengers) regarding the independent variable (population) would be analyzed. Its result ranges between 0 and 1, being justification of such a close relation to the unit. It is calculated as follows:

$$R^2 \equiv 1 - \frac{SS_{\text{err}}}{SS_{\text{tot}}}$$

Where:

- SSerr = total sum of squared residuals
- SStot = total sum of squares

As it might be observed in appendix 2, the evolution of

Table 2. Coefficient of determination in Municipal area, Metropolitan area and Metropolitan airport area (1970 and 2010).

	Municipal area	Metropolitan area	Metropolitan airport area
1970	0.46	0.42	0.40
2010	0.76	0.73	0.70

Source: Own elaboration

Table 3. Spearman´s Correlation coefficient in Municipal area, Metropolitan area and Metropolitan airport area (1970 and 2010).

	Municipal area	Metropolitan area	Metropolitan airport area
1970	0,36	0,35	0,33
2010	0,42	0,48	0,49

Source: Own elaboration

this coefficient would turn out to be positive during the last 40 years, so from working both variables of seemingly independent form in 1970, the level of correlation has grown even near 80 % in 2010 on having become popular the air transport (low cost airlines, LCA) and having increased the acquisitive levels (Dobruszkes, 1999).(Table 2)

According to this procedure, the coefficient of determination would be more adapted for the municipal scale, since in both years it is when a higher result is obtained. The problem appears as we observe the representation of the points in the graph so, when a mathematically perfect relation does not exist between the variables, not any variation in the number of passengers might be explained by the variation of the number of inhabitants of the city.

That is, far from obtaining a more or less homogeneous distribution of the points along the straight line of regression, a marked concentration of the same ones is observed (Appendix 2). This indicates that, in spite of the high current R^2, statistically the analysis would not turn out to be significant since the information of this item does not fulfil the requirements of the analysis of regression. According to (Gauss-Markow Theorem): normal statistical distribution, non-selfcorrelation of remainders and homocedasticity, made that dissuades its utilization

Due to this, the study is complemented by the analysis of correlation. In principle, the possibility of the analysis of Pearson's correlation was considered, but because of the nature of the information, it was offering the same problems that the analysis of regression. It is important to remember that both methods are extremely similar. The only difference between both consists on the fact that the coefficient of correlation does not presuppose dependence of a variable regarding other one, that is, it does not imply a causal relation, as it happens in the analysis of regression.

Consequently, the analysis of Spearman's correlation was finally used. Though the conversion of the original information, in ordinal variables of discreet character is managed to correct two of the mistakes that were influencing the results: the existence of extreme values, and the lack of normality in the statistical distribution of the information.

Unlike Pearson's coefficient, it does not need numerical variables with normal distribution, but, even so, it allows variables of free traffic. The result of this coefficient ranges between -1 and 1, which indicates a positive association between both variables the nearest to one. The Spearman's correlation is calculated as follows:

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Where:

- di = xi – yi between the ranks of each observation on the two variables (population and passengers)
- n = number of case studies.

Consequently, after applying the corresponding formula for each of the territorial entities, the Metropolitan Airport Area is used was demographic reference to 2010, since it is the territorial entity that presents a higher result (49 %).(Table 3)

This indicates that in half of the studied cases exists a positive correlation, that is, the number of passengers received in Spanish airports is in direct relation with the increase of the demographic volume to which they serve in 50 % of the cases.

For its graphical representation, it has been decided to reverse the numerical order of the axes in order to the airports with better positions in both hierarchies remain positioned graphically over the rest (Appendix 4). In addition to this, it has been considered to be opportune to represent a theoretical line, like a trend line for the analy-

sis of regression, with the aim to observe graphically where airports are situated beyond or nearer the best linear adjustment of the information ([1] This is very similar to the "residues" of the analysis of regression, that is, the theoretical distance that exists of every case studied with regard to the straight line of better linear adjustment (straight line of regression). Nevertheless, in this occasion, it is corrected for its utilization with the coefficient of Spearman's correlation).

RESULTS

Observing the attached graphs, related to 1970 and 2010, the magnitude of correlation between both variables has grown with the time, since of arranging the points like circle, has passed to a more linear distribution. This means that in 1970, the studied cases were more distanced from the theoretical distribution of best adjustment. Nevertheless, in 2010, the distribution is narrower, in such a way that the margin of variation of the number of passengers regards the demographic volume shorter. That is, the correlation is bigger.

While dealing with ranges, the maximum and minimal differences that are given in the categorization of the demographic and airport hierarchy might be observed (Appendix 5). In broad lines, it is observed how the touristic airports (archipelagoes and Mediterranean coast) register a few positive differences on being influenced obviously by the tourist factor.

In the opposite side, the rest of Spanish airports register negative differences for different circumstances: Vitoria, San Sebastian, Logrono and Pamplona for the functional centrality which Bilbao carries out in the North of Spain; Saragossa and Reus like consequence of the supremacy of Barcelona- El Prat in the Northeastern peninsular quadrant; Murcia for its subjection the airport of Alicante-Altet (San Javier is known as Alicante South); Cordoba and Jerez for the top influence that Seville generates in the Andalusian region; etc.

The joint interpretation of this information in accordance with both representations, allow to advance certain observations:

1) A distinguished role of some canters in the Spanish airport system:

- Some centres given priority in the urban national system that, as expected, have traffic surplus. Both the airport of Madrid-Barajas and Barcelona-El Prat register a number of passengers superior to the percentage it would correspond to them for the number of inhabitants of its municipalities. In both cases, this is because of being the two main national metropolis of Spain, with an increasing importance in the international context. In addition, for the case of Barajas, the condition of Madrid like the capital of the State and its centrality add an extra reason to this matter.
- Centres with traffic surplus promoted by the tourist function, especially, in the international area. Airports like Majorca, Tenerife, Las Palmas de Gran Canaria, Malaga and Alicante also register a major air traffic in which it would be expected at first depending on the demographic weight of the municipalities where they are but, this time, motivated by its tourist condition of first order.
- Together with the previous ones, another group with air traffic surplus was promoted by the tourist function. Nevertheless, in this occasion, these endorsed a minor demographic and air weight for its minor projection. Amongst them, it is relevant to stand out traditional destinations such as Ibiza and Gerona, as well as new infrastructures that have experienced a spectacular growth during these four decades (Lanzarote, Fuerteventura, Menorca, Palma, Gomera and Hierro). In all of them, the charter segment and the vacation packages propitiated a great arrival of tourists and passengers in previous decades. Nevertheless, at present, the regular traffic and the low cost airlines are responsible of the favourable evolution of these infrastructures.

2) Nevertheless, distinguished role of some overshadows the minimized role of others:

- Both in 1970 and in 2010 we find important national and regional airports in which the number of passengers was considerably low to the expected one according to the demographic volume to which it supplies. It is the case of the governing centres that direct the national axes from the centre to the peninsular periphery (Santiago, Bilbao, Seville, Valencia) or regional centres that try to serve to its respective urban systems (Zaragossa, Valladolid, Cordoba, Vigo, Santander, Oviedo, Corunna). Regarding 1970, only Santiago, Corunna, Vigo, Oviedo, Santander, Bilbao and Valladolid have registered a more identical evolution between both variables, since in 2010 their positions are situated nearer the theoretical straight line. Their regional roles in the north peninsular third, together with the impulse received during the last years as consequence of the LCA, justify this evolution.
- Other airports, in spite of their deficit of air traffic with regard to the total population, have evolved favourably during the last years thanks to the “low cost” phenomenon. Such is the case of Murcia, Granada and Reus. All of them have minimized the imbalances between both variables with regard to 1970, even though only Reus has reached the point of balance. Consequently, the imbalance with regard to the population reality is still in force. Nevertheless, airlines like Ryan air, Easy Jet, Air Berlin or Vueling have motivated a light compensation between both variables on having allowed an exponential growth of these airport infrastructures.

3) In the third group, a conglomerate of centres is inclu-

ded where the volume of air traffic is very limited as consequence of the local character of its airport facilities. Hence, its ranks so slowed down in the airport Spanish hierarchy. That is, the lack of international projection and a considerable deficit in the domestic traffic, encircled almost exclusively to Madrid and Barcelona, impede enormously a correlation balanced population-passenger. It is the case of centers as León, Badajoz, Logrono, Salamanca, Albacete, Burgos, San Sebastian, Pamplona, Vitoria or San Sebastian. The rest of airports constitute irrelevant information, since they do not contribute to the explanation.

CONCLUSSIONS

The changes derived from the liberalization process of air transport are not affecting equitably in all the Spanish airports. That is, in spite of the great number of existing airports, the differences between them continue being very marked, since the air traffic from / to Spain is kept very concentrated in a few privileged infrastructures, for their economic-political-functional reputation (Madrid and, in a fewer extent, Barcelona), or for their tourist reputation (both archipelagos and Mediterranean coast). The rest of them represent a minor importance, even those of national character (Santiago, Seville, Valencia, Bilbao) whose demographic representation does not correspond with its aeronautical weight.

Hereby, it is considered that the air transportation network not only is adapted to the population, but it is influenced by other functionalities that accentuate these contrasts: priority traditional role of Madrid over the rest, the desenclavement factor of certain airports, the partial political decisions, the decisive phenomenon of the tourism and the centralized air management model.

Fundamentally, these last two factors are the ones that help intensify the differences for the Spanish case. On the one hand, the tourism, since in Spain continues being one of the mayor tourist world powers (WTO, 2010) and, consequently, the decompensation between both hierarchies will be still in force on promoting urban municipalities of local - regional character but of great tourist dimension, opposite to other cities that, even though also tourist, they are characterized for being important governing functional centres of the urban Spanish hierarchy.

On the other hand, the current system of air management, which harms the capacity in the majority of Spanish airports, since its centralized character carries the boost of the concentration of the long distance and interconnection traffic principally in an only airport and one only company, limiting the rest of airports' possibilities of growth and expansion.

Hence, the need to undertake a process of reform towards a system more transparent and orientated in major measure under business criteria that allows to optimize in every airport its contribution to the economic growth of the territory where these are located (Fageda, and Bel, 2006). With it, the presence of the principal tourist airports would be kept, the number of big international airports would increase and there would limit itself the constant opening of these infrastructures in almost all the capitals of province would be limited (criteria of efficiency and economic profitability opposite to political interests).

At present, the debate on the airport management centres on Catalonia with the airport of The Prat, which persue AENA's decentralization and the most autonomous management of the airport infrastructures.

So far, the obtained advances have allowed the introduction of the administrative regional and local management, and even, slight private initiatives. That is, we attend a new action model. Nevertheless, unlike what happens in other neighbouring countries, this "apparent change" turns out to be insufficient since the State continues supporting the control of the airport management. Only the time will tell us towards where it will evolve the air Spanish panorama.

ACKNOWLEDGEMENTS

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Notes

1. Because of the lack of Metropolitan official Areas, different definitions from urban/land planning plans have been used, elaborated by the respective Spanish Autonomous Communities or public entities of metropolitan transport.
In those cities in which information have not been found, the Project AUDES has been used as a reference that, though still unfinished, it allows us to obtain the required information.
The project AUDES belongs to the University of the University of Castilla-La Mancha (Spain) that tries to define the urban areas (UA) of Spain. The criteria used to establish them are: morphologic (to identify the core where the nuclear population, in an Urban Area, is settled) and functional (to determine the adjacent municipalities that join every Urban Area through the analysis of the daily movements for working or studying purposes). The definitions, criteria and used methods take partially into consideration the proposals from the Statistic Canadian Office, even though ideas from the United States Census Office and from several Spanish and international investigators are also considered.

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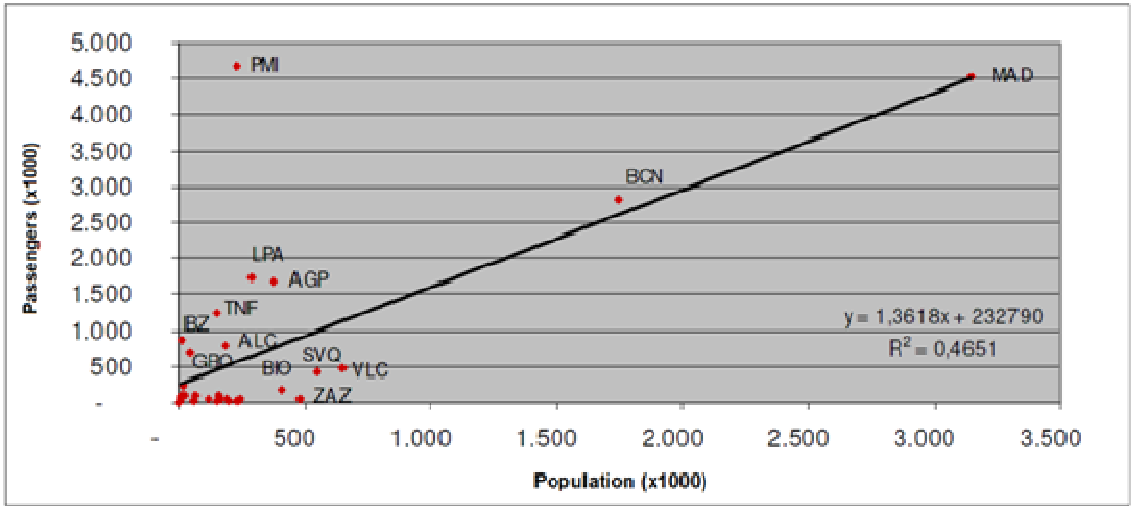
Appendix 1. Total air traffic and population in municipal area, metropolitana rea (MA) and airport metropolitana area (AMA). Note 1

	1970				2010			
	Passengers	Municipal Area	AM	AMA	Passengers	Municipal area	AM	AMA
MADRID-BARAJAS	4518212	3146071	3514246	3686546	50846494	3123271	5421879	5856582
BARCELONA	2828713	1745142	2621588	2882720	30272084	1615908	4615663	5021988
PALMA DE MALLORCA	4666502	234098	242674	242674	22832857	396570	471058	471058
MALAGA	1678392	374452	387492	486894	12813472	566447	864177	1189912
GRAN CANARIA	1742281	287038	396587	396587	10212123	381123	634295	634295
ALICANTE	804045	184716	220705	390394	9578304	331750	770039	1143198
TENERIFE	1234199	151361	258150	258150	12488604	221956	517927	517927
VALENCIA	458987	653690	1056429	1218991	5779343	807200	1659697	1968205
GIRONA	696804	50338	111024	111024	5510970	94484	140061	140061
LANZAROTE	212709	21906	41146	41146	5438178	59040	139506	139506
IBIZA	878387	16943	45075	45075	4647360	46835	125053	125053
FUERTEVENTURA	68515	6680	17957	39863	4492003	35293	100929	159969
SEVILLA	422413	548072	709539	709539	4392148	699759	1356703	1356703
BILBAO	183773	410490	415955	549991	4172903	353340	934739	1167216
MENORCA	238992	19279	50217	50217	2605932	28904	92434	92434
SANTIAGO	89436	70893	99110	477996	1917466	94339	155985	684371
MURCIA-SAN JAVIER	37933	243759	322381	535868	1876255	430571	711398	1114079
ASTURIAS	98579	154117	713128	713128	1530245	220264	827047	827047
FGL GRANADA-JAEN	-	-	-	-	1422014	236988	478394	653288
JEREZ	-	-	-	-	1303817	205364	478914	720557
VIGO	25229	197144	322699	375261	1278762	295703	516452	597201
REUS	31137	59095	100307	213509	1278074	107770	468681	671122
A CORUÑA	54816	189654	270324	415788	1174970	245164	392234	561269
LA PALMA	92412	13163	73749	73749	1151357	17132	86528	86528
ALMERIA	55580	114510	127899	140783	1024303	187521	218437	367821
SANTANDER	12834	149704	191822	191822	856606	182302	323113	323113
ZARAGOZA	57959	479845	484236	484236	594952	666129	710425	710425
VALLADOLID	17063	236341	255360	318006	479689	318461	392183	474809
PAMPLONA	-	-	-	-	434477	197275	310415	494663
SAN SEBASTIAN	37288	165829	294409	573521	403191	184248	402928	832680
MELILLA	27362	64942	60892	60892	314643	71448	71448	71448
EL HIERRO	-	-	-	-	195425	4938	10753	10753
LEON	-	-	-	-	123183	135119	211480	279449
BADAJOZ	-	-	-	-	81010	146832	250000	305568
VITORIA	-	-	-	-	67818	232477	226000	729411
SALAMANCA	-	-	-	-	60103	155740	201101	267773
LOGROÑO	-	-	-	-	47896	150071	156000	388477
LA GOMERA	-	-	-	-	41890	8744	22622	22622
CEUTA /HELIPUERTO	-	-	-	-	25645	77389	77389	77389
CORDOBA	-	-	-	-	22230	325453	338373	338373
ALBACETE	-	-	-	-	19254	166909	200444	200444
BURGOS	-	-	-	-	13037	177879	191345	191345
EL AAIUN	107159	24048	24048	24048	-	-	-	-
VILLA CISNEROS	13364	5454	5454	5454	-	-	-	-
LA GUERA	4737	2544	2544	2544	-	-	-	-

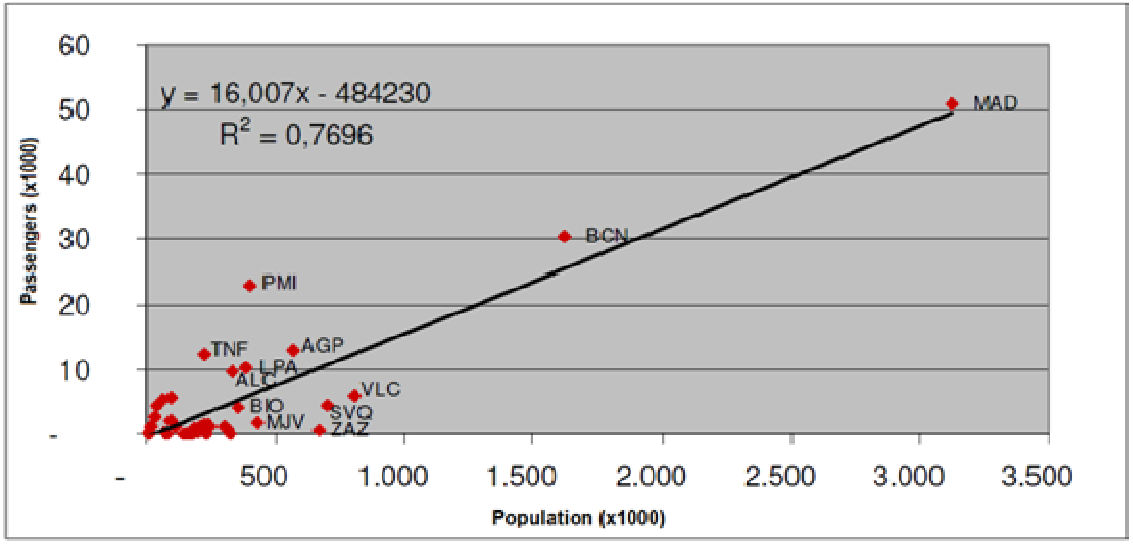
Souce: Own elaboration

Appendix 2. Regression analysis. Relationship between passengers-inhabitants (1970-2010).

1970



2010



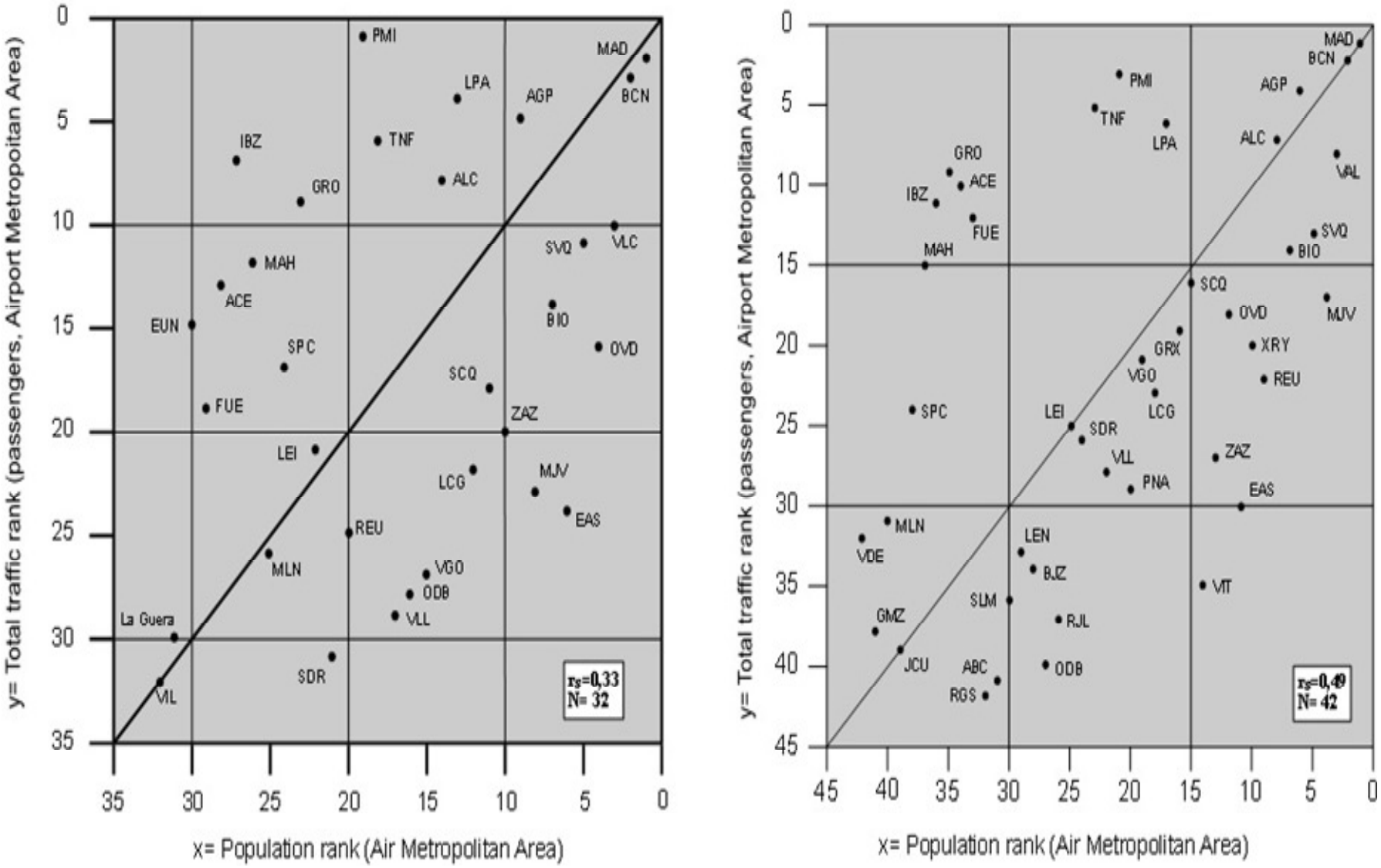
Source: Own elaboration

Appendix 3. Residual analysis in regression, Spanish airports, 1970 – 2010

	1970	2010
MADRID-BARAJAS	0,001341238	0,291334896
BARCELONA	0,247048726	1,065252237
PALMA DE MALLORCA	4,632687087	3,695851582
MALAGA	1,053416741	0,921448542
GRAN CANARIA	1,259360566	1,000958308
ALICANTE	0,359941989	1,035038318
TENERIFE	0,895357573	2,051651492
VALENCIA	-0,747525498	-1,449864479
GIRONA	0,445224592	0,976341737
LANZAROTE	-0,05619242	1,084052126
IBIZA	0,700853871	0,954364031
FUERTEVENTURA	-0,195186487	0,960765409
SEVILLA	-0,626776631	-1,377431143
BILBAO	-0,684514295	-0,217502579
MENORCA	-0,022574842	0,572260058
SANTIAGO	-0,27007917	0,194196742
MURCIA-SAN JAVIER	-0,593086485	-0,986944352
ASTURIAS	-0,387377927	-0,329135713
FGL GRANADA-JAEN	-	-0,411010869
JEREZ DE LA FRONTERA	-	-0,326506714
VIGO	-0,535922697	-0,646901669
REUS	-0,317625963	0,008116884
A CORUÑA	-0,49112984	-0,493319056
LA PALMA	-0,178221831	0,296498885
ALMERIA	-0,375065118	-0,3251798
SANTANDER	-0,477146207	-0,343509144
ZARAGOZA	-0,932488308	-2,087204663
VALLADOLID	-0,605209802	-0,900275004
PAMPLONA	-	-0,487645699
SAN SEBASTIAN	-0,474336786	-0,449045187
MELILLA	-0,330840094	-0,075089397
EL HIERRO	-	0,130811288
LEON	-	-0,338757214
BADAJOZ	-	-0,388775955
VITORIA	-	-0,690223065
SALAMANCA	-	-0,424384312
LOGROÑO	-	-0,407279789
LA GOMERA	-	0,084103588
CEUTA /HELIPUERTO	-	-0,15874338
CORDOBA	-0,599578989	-1,024283081
ALBACETE	-	-0,47221821
BURGOS	-	-0,511815649
EL AIÚN	-0,178307265	-
VILLA CISNEROS	-0,255397301	-
LA GUERA	-0,260648427	-

Source: Own elaboration

Appendix 4. Correlation between popultaion rank (in the airport metropolitana rea) and the rank of the total air traffic of airport´s metropolitan area. Years 1970 and 2010.



Source: Own elaboration (IATA airport codes)

Appendix 5. Selected differences between total air traffic rank (y) and population airport metropolitan area rank (x). Years 1970 and 2010.

Year 1970

Population/ Total air traffic (r_s=0,33)							
Extreme differences (d)				**Other differences (d)**			
Positive		**Negative**		**Positive**		**Negative**	
Ibiza	20	S. Sebastián	-18	La Palma	7	Santiago	-7
P. Mallorca	18	Murcia	-15	Alicante	6	Bilbao	-7
Lanzarote	15	Asturias	-12	Malaga	4	Valencia	-7
El Aiún	15	Vigo	-12	Almeria	1	Seville	-6
Gerona	14	Córdoba	-12	Villa Cisneros	1	Reus	-5
Menorca	14	Valladolid	-12	La Guera	0	Melilla	-1
Tenerife	12	Zaragoza	-10			Barcelona	-1
Fuerteventura	10	La Coruña	-10			Madrid	-1
Las Palmas	9	Santander	-10				

Year 2010

Population/ Total air traffic (r_s=0.49)							
Extreme differences (d)				**Other differences (d)**			
Positive		**Negative**		**Positive**		**Negative**	
Gerona	26	Vitoria	-21	Melilla	9	Pamplona	-9
Ibiza	25	S. Sebastián	-19	La Gomera	3	Seville	-8
Lanzarote	24	Zaragoza	-14	Malaga	2	Bilbao	-7
Menorca	22	Murcia	-13	Alicante	1	Badajoz	-6
Fuerteventura	21	Reus	-13	Madrid-Barajas	0	Salamanca	-6
P. Mallorca	18	Córdoba	-13	Barcelona	0	Valladolid	-6
Tenerife	18	Logroño	-11	Almeria	0	Asturias	-6
La Palma	14	Jerez	-10	Ceuta/helipuerto	0	La Coruña	-5
Gran Canaria	11	Albacete	-10			Valencia	-5
El Hierro	10	Burgos	-10			Leon	-4
						FGL Granada-Jaén	-3
						Santander	-2
						Vigo	-2
						Santiago	-1