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Impacto no Sector do Turismo da Área de Influencia dos Aeroportos Portugueses devido à Operação de Companhias de Baixo Custo

Impact in Tourism Sector of **Portuguese Airports Hinterland due to Low-Cost Carriers Operation**

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Resumo | Devido à desregulamentação do transporte aéreo europeu, as LCC's têm mostrado um rápido crescimento na ultima década. Esta mudança no mercado tem afetado a maneira como muitos aeroportos operam e é esperado que isto influencie não só o desempenho dos aeroportos, mas também a sua área de influencia. O desenvolvimento turístico é um dos principais beneficiários deste novo paradigma. Este estudo foca-se na identificação dos possíveis impactos causados pela operação de LCC's no turismo, durante um período de sete anos, avaliando o desempenho aeroportuário através de um *self-benchmark* utilizando uma metodologia MCDA e comparando os resultados com a evolução de alguns indicadores turísticos da área de influencia dos aeroportos portugueses.

Palavra-chave | Transporte aéreo, desempenho aeroportuário, MCDA, turismo, LCC

Abstract | Due to the deregulation of the airline market in Europe, LCC's have shown a fast growth in the last decade. This change in airline market has affected the way many airports operate and it's expected that this impacts not only in airport performance, but also in its hinterland. Tourism development is one of the main beneficiaries of this new paradigm. This study focus on the identification of the possible impacts in tourism due to LCC's operation, during a seven years' period, by assessing

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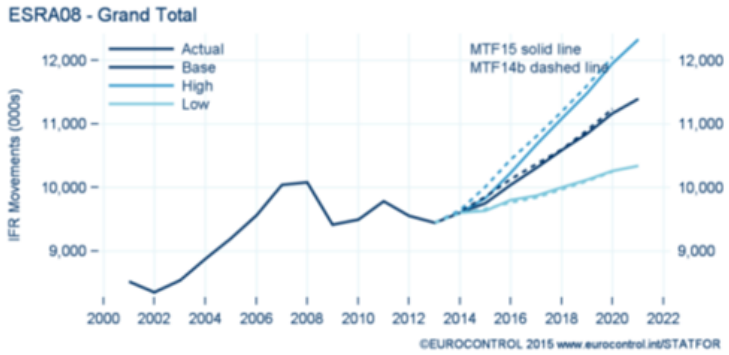
airports performance through a self-benchmark with a MCDA methodology and comparing the results with some tourism indicators in the Portuguese airports hinterland.

Keywords | Air transport, airport performance, MCDA, tourism, LCC

1. Introduction

In the last decades, aviation has shown a continuous growth in aircraft movements number, but more important in transported passenger number. Although there have been some temporarily interruptions due to extreme events, like terrorism, economic crisis and war, the overall growth has been positive and exponential (Liebert, 2011). Figure 1 shows Instrument Flight Rules (IFR) movements evolution from 2001 to 2013 and forecast growth for 2014-2021 (Eurocontrol, 2014).



Source: (Eurocontrol, 2014)

Figure 1 | IFR movements evolution for 2001 to 2013 and forecast growth for 2014- 2021

One of the major causes of the rapid growth in air traffic was the air transport deregulation in the seventies. This lead to the progressive liberation of the market, which open the door to new revolutionary business model aiming to minimize airline operational costs. As a consequence of the lower operational cost, airlines adopting this types of business model began decreasing its ticket prices, reaching a market of customers who previously could afford legacy carriers high rates. Due the characteristics of such operation these airlines are called Low-Cost Carriers (LCC's), (Rosa, Baltazar, & Silva, 2015).

European Union liberalization packages began by removing regulation over fares and route entry in the nineties, causing the revolution of LCC's in Europe (ACI, 2011), which was led by Ireland and United Kingdom, with Ryanair and EasyJet respectively.

2. Airports hinterland

The change in the European airline market has affected the way many airports operate and it's expected that this impacts not only in airports performance, but also in its hinterland.

Today airports, previously only seen as infrastructures for air transport, are also drivers for regional and national development, allowing these destinations to become more appealing for investors

(Almeida, 2011). (Vaz, Silva, Baltazar, & Marques, 2013) say that tourism development is one of the main beneficiaries of this new paradigm. Realizing the potential for tourism development, in some regions were created strategic partnerships and financing funds between regional tourism bodies and the private sector (Figueiredo, 2010).

The definition of an airport hinterland is very broad. Traditionally, hinterland is measured by a radius of several kilometers around the airport or the travel time from one point to the airport. However, this definition may be considered too simplistic because there are other indicators that can determine such area of influence. Therefore, current literature prefers to do it in combination with certain pre-defined criteria: the assessment of the impact or effectiveness of a certain airport, or from the perspective of tourism destination (Alves, Baltazar, Silva, Garra, & Vaz, 2013).

An airport hinterland is related to the geographical reach of the airport services to the surrounding population and economy that they serve. In other words, hinterland is a geographical zone comprehending potential users and passengers for the airport (Alves, 2014).

Alves (2014) describes several typologies of hinterland:

(i) Immediate hinterland: refers to airport area itself;

(ii) Primary hinterland: area where airport and city assume a commanding role on life in that area;

(iii) Commodity hinterland: area based in the shipment of particular types of commodities;

(iv) Inferred hinterland: airport hegemony over a particular area that satisfies demand for the area it serves.

3. Airports Benchmarking

3.1. Introduction

Liberalization of air transport industry led to growth of air traffic and consequently increased airports congestion. To face this problem, airports need to expand their capacity and to improve runway and terminal systems efficiency, which created a need for airports to start self-benchmarking and to compare them with other airports (Liebert, 2011).

Airports Council International (ACI) defines benchmarking as an economic standard to measure business performance by comparing productivity and efficiency, evaluating specific processes, policies and strategies, and to determine the overall business performance. Assessing the implementation of airport's strategic planning, benchmarking measure the performance of discrete airport functions and by identifying and adopting the best practices, airport can increase its efficiency, quality and customer satisfaction. In other words, airport benchmarking connects day-to-day operations and management strategies with the airports short and long-term actions plans and initiatives (ACI, 2006).

There are two main categories of benchmarking (Lopes, 2008):

(i) Partial – Assesses and compares individual processes, functions and services;

(ii) Holistic – Creates a systematic approach to define and assess a critical group of processes, functions and services, which all together indicate the relative performance of the organization as a whole.

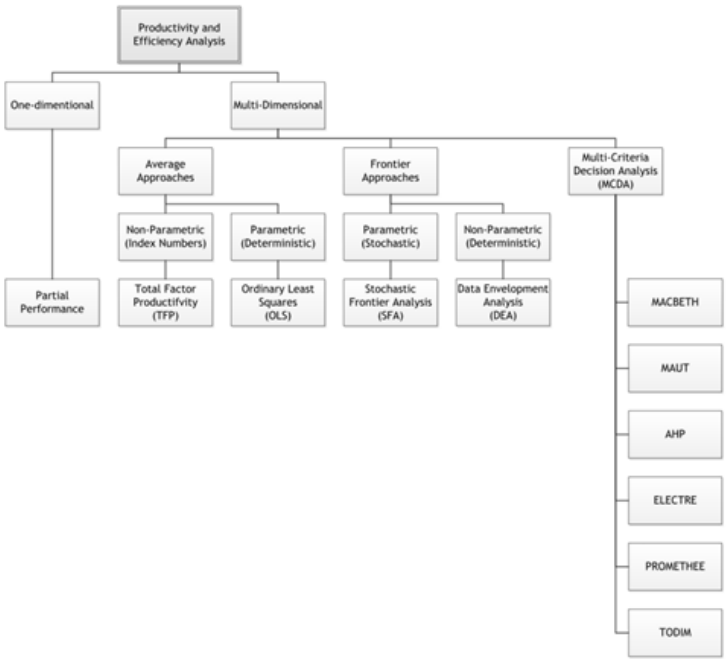
Within partial and holistic categories, there are two predominant types of benchmarking: Internal benchmarking, also known as Self-benchmarking, within the organization which compares internal performance of processes, functions and services

over a time series; and External benchmarking, which compares the organization performance with peers or other organization in the same sector of activity at a precise point in time or through a time series (ACI, 2006).

3.2. Methodologies for airport benchmarking

There are a large variety of methods to benchmark, which allows to choose the most appropriate methodology to achieve the objectives.

Since airports are a multi processes system, a group of quantitative methodologies have been developed to assess productivity and efficiency of airports performance (Liebert, 2011). Throughout the years a variety of methodologies appeared to assess productivity and efficiency. (Braz, 2011; von Hirschhausen & Cullmann, 2005) organized these methodologies by type of approach as shown in figure 2.



Source: adapted from (Braz, 2011; von Hirschhausen & Cullmann, 2005).

Figure 2 | Quantitative methodologies to assess productivity and efficiency

One-directional approach, particularly partial measures, consist in dividing one output by one in-put which makes this approach the simplest for to assess productivity. However, its results have to be taken with caution, because they fail to capture effects between different inputs. For this reason, to access airports performance is recommended to use multi-dimensional approaches.

After a careful analysis of the multi-dimensional methods, Multi-Criteria Decision Analysis (MCDA) was chosen as the best one to apply in this study.

MCDA is a tool intended to help decision makers to make a choice when faced with situations of multiple and conflicting criteria's, in other words taking in consideration that different choices or courses of action becomes a MCDM problem (Belton & Stewart, 2002). MCDA methods have been developed to improve the quality of decisions involving multiple criteria by making choices more

explicit, rational and efficient (Marttunen, 2010).

This methodology meets the objective to analyze airport performance considering a wide range of key performance areas and indicators that among them have different relevance. The weakness of this method lies on the fact that the assessment of the key performance areas and indicators is based on expert's experience and their own judgment, so results can be affected by subjective factors (Jardim, 2012).

4. Methodology

After a careful analysis of all available MCDA tools, Braz (2011) concluded that Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH) complied with the requirements needed for this type of research work. Also, Bana e Costa et al. (2005) underlines this is a multi-criteria decision analysis approach that requires only qualitative judgments about differences of value to help a decision maker, or a decision-advising group, to quantify the relative attractiveness among several options.

4.1. Measuring attractiveness through a categorical based evaluation technique (MACBETH)

MACBETH is a decision making method that allows the evaluation of options in a multiple criteria scenary. The main difference between MACBETH and other MCDA tools is that it needs only qualitative judgements about the difference of attractiveness between two elements at a time, in order to generate numerical scores for the options in each criteria and to weight the criterias (Baltazar, Jardim, Alves, & Silva, 2014).

When the judgements by the evaluator are set, their consistency is verified and corrections may be needed to avoid inconsistencies if they arise. Then MACBETH advances into the construction of a quantitative evaluation model, from the evaluator's qualitative judgements. For this quantitative evaluation model is calculated a value scale for each criteria and the weights for the criterias. Value scores are subsequently aggregated additively to calculate the overall value scores that reflect their attractiveness taking all the criteria into consideration (Gómez et al., 2007).

First of all, and in order to turn the final result more robust, it is necessary to obtain a large data collection about what is going to be studied, so that the decision group can have a global view about the decisions to be taken. The next step is to create a decision tree with nodes, that is, a decision model. The nodes correspond to indicators that are going to be taken into account; each decision maker defines the attractiveness of each indicator in the tree.

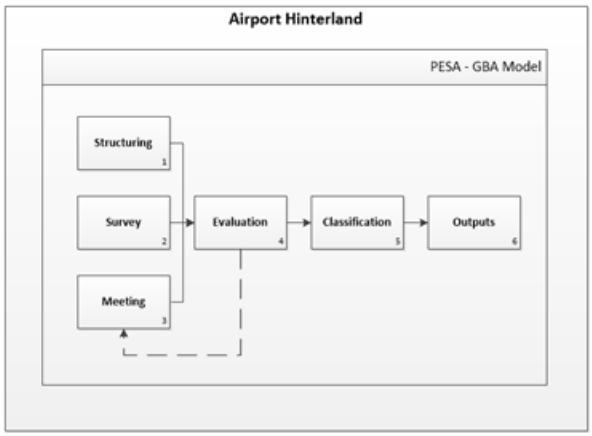
MACBETH have seven qualitative categories of difference in attractiveness: no difference, very weak, weak, moderate, strong, very strong, and extreme (Bana e Costa, Corte, & Vansnick, 2012).

This method is complex but very important because in this particular it values the judgements of aviation managers and experts, it allows to gather all the decisions maker's opinions in the difference of attractiveness and adjusts the model so the final result can take into account all the opinions.

4.2. Performance and efficiency support analysis for global benchmarking of airports (PESA – GBA)

Performance and Efficiency Support Analysis for Global Benchmarking of Airports (PESA – GBA) model was built in order to assess airports performance and efficiency in each Key Performance Area (KPA) and each Key Performance Indicator (KPI). This model is based on the MACBETH mathematical foundations and it consists in

a well-organized arrangement of 6 steps, as shown in Figure 3.



Source: Own elaboration

Figure 3 | Steps for building a PESA – GBA model.

Step 1 consists in collecting the airport data for each KPI's and then building a performance descriptor, which is a scale defined in four levels (L1, L2, L3 and L4) for each KPI by analyzing the data as explained in Table 1.

Table 1 | Performance descriptor

Level	Description
L4 (Good)	Using the year with the best value in the data collected.
L3	Using the 1/3 of the best value in the data collected.
L4	Using the 2/3 of the best value in the data collected.
L1(Neutral)	Using the year with the worst value in the data collected.

Source: own elaboration

Step 2 and Step 3 represent the steps where the expert's judgments will be collected, through survey and/or meeting. Using statistical averaging of the expert's answers a status quo scale is created that allows in Step 4 the creation of judgement matrix for each KPI and each KPA. With all the judgments matrix created, the model calculates each KPI and KPA weight ponderation.

Step 5 uses the performance descriptions and weight ponderation to obtain the score for each KPA and KPI in each year studied.

Step 6 produces a large variety of outputs that allow to monitor performance over time. These outputs consist in performance profiles, sensibility analysis, options and difference profiles, and Value by KPI, KPA, airports and airport groups (external benchmarking).

4.3. Key performance areas (KPA's) and key performance indicators (KPI's)

There are many different circumstances related with airport operations (aviation activities, commercial activities, location constraints, etc.) and each airport needs to find different key perfor-

mance areas and indicators in order to be the most relevant and useful for the analysis (Jardim, 2012).

ACI (2012) elaborated a guide to airport performance measure, which allowed the construction of a decision tree with six KPA's: Core, Safety and Security, Service Quality, Productivity/Cost Efficiency, Financial/Commercial, and Environmental. Each KPA is associated with several KPI's, a total of forty-two items referred in Baltazar and Silva (2016):

(i) Core - Used to characterize and categorize airports, such as the number of passengers and operations. Although airports may have little control over these core indicators, especially in the short term, they are important indicators about overall airport activity, and important drivers and components of other indicators (ACI, 2012). This KPA is describe by five KPI's;

(ii) Safety and Security – These are critical airport functions, which sometimes overlap. Safety indicators are used to track airfield safety issues as well as safety issues involving other portions of the airport, including roadways, and general employee safety. Security indicators may be used to track security violations, thefts and crimes, and responsiveness (ACI, 2012). This KPA is describe by six KPI's;

(iii) Service Quality – Focus both on how passengers perceive the level of service provided by the airport, and on objective measures of service delivery (ACI, 2012). This KPA is describe by eight KPI's;

(iv) Productivity/Cost Efficiency - Airports often combine productivity and cost effectiveness in a single KPA. As used by ICAO, productivity refers to the relationship of output to input, while cost effectiveness refers to the financial input or cost required to produce a non-financial output (ACI, 2012). This KPA is describe by nine KPI's;

(v) Financial/Commercial – Covers a broad range of measures that analyses airport's financial performance, including airport charges, airport financial strength and sustainability, and the performance of individual commercial functions (ACI, 2012). This KPA is describe by eight KPI's;

(vi) Environmental - Many airports have developed or are developing environmental performance indicators. These indicators are used to track an airport's progress in minimizing the environmental impacts of its operations (ACI, 2012). This KPA is describe by six KPI's.

In this particular, to evaluate the tourism evolution it was taken into account some socio-economic indicators presented in literature, and as available in the National Statistics Institute (INE), which resulted in the following set (Alves, 2014):

(i) Hotel Establishments - Number of hotels, apart hotel, guesthouses, motels, hostels, tourist villages, by square kilometer;

(ii) Accommodation Capacity – Number of beds available in Hotel Establishments;

(iii) Occupation Rate - Ratio between the numbers of beds occupied in hotel establishments and the number of beds offered.

4.4. Experts survey and meetings

As explain before, to obtain the judgment matrix for KPI's and KPA's an online survey was sent to more than five hundred experts of the six KPA's of the model. The results will be the inputs for Step 4 of PESA – GBA model.

This survey consists in the following six steps:

(i) Welcome message;

(ii) Experts personal information: name, email and professional expertise;

(iii) To rank the KPA's by order of relevance, from 1 (least relevant) to 6 (most relevant). Different KPA's can be assigned with the same rank;

(iv) To choose the KPA of the experts' field of expertise;

(v) To rank the KPI's from the KPA selected by order of relevance, from 1 (least relevant) to 6 (most relevant). Different KPI's can be assigned with the same rank;

(vi) To fill the judgement matrix for all KPI's of a specific KPA. For each judgement matrix six questions are asked, so that: A refers to the best option of the KPI, D refers to the worst option of the KPI, B and C are intermediate values equally distributed between A and D. To answer these questions six semantic categories of difference of attractiveness are offered: "very weak", "weak", "moderate", "strong", "very strong" or "extreme":
- Question 1. AD - A is more attractive than D. The difference is?
- Question 2. AC - A is more attractive than C. The difference is?
- Question 3. BD - B is more attractive than D. The difference is?
- Question 4. AB - A is more attractive than B. The difference is?
- Question 5. BC - B is more attractive than C. The difference is?
- Question 6. CD - C is more attractive than D. The difference is?

Thus with statistical averaging of the experts' answers, it is possible to build three outputs that reflect the expert's opinions for each KPA and associated KPI's.

Meetings are also a process accepted by this model to get experts opinions in assessing airports performance. The meetings consist in a gathering of key players who wish to analyze and solve an important issue related to their organization, assisted by an impartial facilitator - who is a specialist in decision analysis and works as a process consultant, using a model of relevant data and judgements created on the spot to assist the group to think more clearly about that issue (Baltazar & Silva, 2016).

In this particular the survey part of the model didn't refer the the achievement level of airports performance, subsequently the assignment of weights for each indicator were obtained throughout negotiation meetings with experts, all professionals involved in aircraft operations, flight safety, and air transport economics and management. The authors played the role of the facilitator allowing difference of opinions of experts, assessing the tradeoffs and agreeing on the final weights and differences of attractiveness (Baltazar & Silva, 2016).

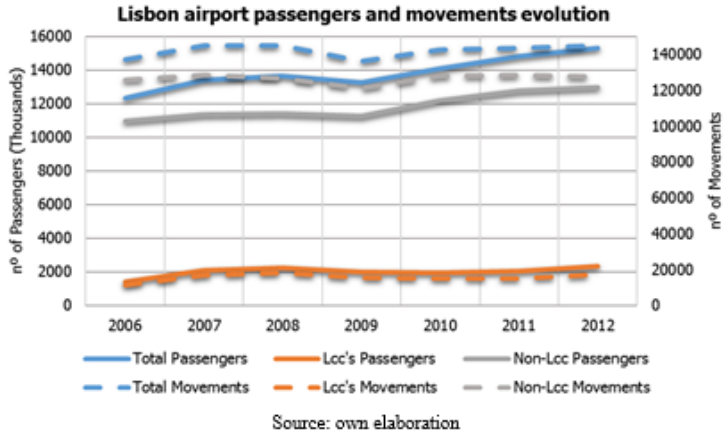
5. Case study

This case study is merely an example to understand how portuguese airports performance and their impacts can be studied with the complete PESA – GBA model. Although, this case study only presents the airports performance final score, note that to achieve this result the model had in consideration all the KPA's and KPI's defined before.

Faro airport (in the South) recorded the largest market share of LCC's, with 13 LCC's representing 83% of all aircraft movements. Oporto (in the North) is the second-largest airport with LCC representation, that is, 4 LCC's performing 20,000 movements. 8 LCC's companies operated at Lisbon airport (Costa & Almeida, 2015).

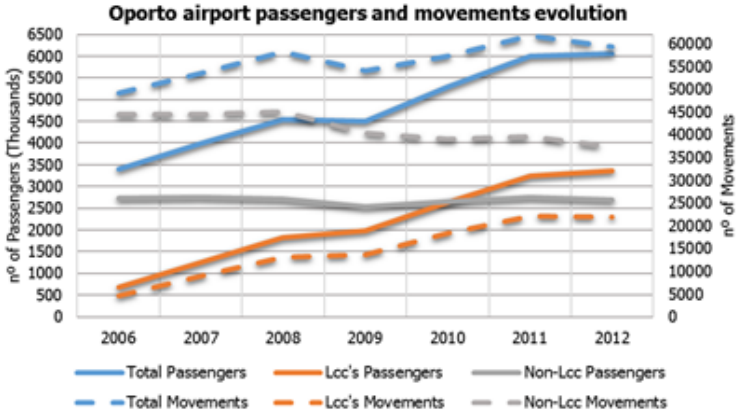
Before applying PESA – GBA model, the evolution of LLC's number of movements and pas-

sengers in Lisbon, Oporto and Faro airports, is analysed (figure 4, figure 5 and figure 6 respectively). Collected data corresponds to a period of seven years, from 2006 to 2012 (ANA - Aeroportos De Portugal, 2006, 2016; Instituto Nacional de Aviação Civil, 2008, 2012). This two parameters analysis is important because despite some key performance indicators depend on the passenger number, others depend on movements one.



Source: own elaboration

Figure 4 | Lisbon airport passengers and movements evolution (2006 -2012)



Source: own elaboration

Figure 5 | Oporto airport passengers and movements evolution (2006 -2012)

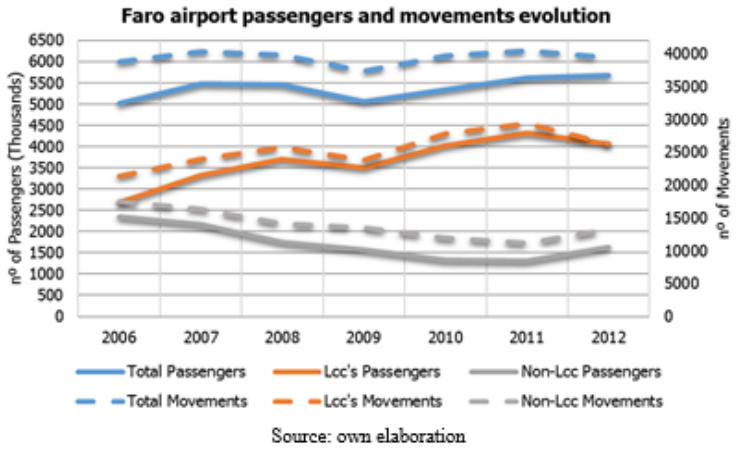


Figure 6 | Faro airport passengers and movements evolution (2006 -2012)

Analysing the previous figures, we can conclude that Lisbon airport LCC's passengers or movements (orange line) exhibit a steady growth since 2006, contrary to the rest of the traffic (grey line). Although this study is focused on LCC's influence in airports performance and efficiency, we have to consider that the growth of LCC's is directly linked with the non LCC's traffic reduction, being the result of this the overall number of passengers and movements (blue line). The Overall traffic has been increasing from 2006, with the exception of two time periods from 2008 to 2009 in all airports, and from 2011 to 2012 in Faro airport.

After applying PESA – GBA model steps, as explained in section 4.2, the model outputs obtained allowed airport performance analysis and depicted if there was any similarity with the passengers and movements variations.

Table 2 presents the value scores of each airport and the score of the airports as a group, and the values of the hinterland tourism indicators collected from (INE, 2013).

Table 2 | Airport scores and respective hinterland tourism indicators values

	2006	2007	2008	2009	2010	2011	2012
Faro Airport Scores	48,40	65,53	63,70	52,35	60,14	65,90	61,52
Hotel Establishments	0,0596	0,0580	0,0582	0,0552	0,0575	0,0581	0,0598
Accommodation Capacity	67742	66848	68605	66662	68805	71233	74133
Occupation Rate	1,86	1,96	1,86	1,77	1,78	1,82	1,80
Lisbon Airport Scores	50,05	62,56	62,12	54,96	58,55	66,60	57,11
Hotel Establishments	0,3291	0,3304	0,3293	0,3278	0,3340	0,3342	0,3428
Accommodation Capacity	75421	77351	79780	81671	83555	87289	89206
Occupation Rate	14,62	16,57	16,22	15,27	15,02	15,54	14,67
Oporto Airport Scores	48,40	65,53	63,70	52,35	60,14	65,90	61,52
Hotel Establishments	0,4097	0,4141	0,4163	0,4052	0,4021	0,4097	0,4183
Accommodation Capacity	44383	44540	47093	47150	47580	50084	51594
Occupation Rate	14,62	15,79	15,22	15,21	15,02	14,65	14,10
Airport Group Scores	47,80	62,56	63,28	56,00	60,43	69,31	59,01
Hotel Establishments	0,7984	0,8024	0,8038	0,7883	0,7937	0,8020	0,8209
Accommodation Capacity	187547	188740	195478	195483	199940	208606	214934
Occupation Rate	31,10	34,32	33,31	32,24	31,82	32,01	30,58

Source: own elaboration

During the experts meeting, as explained in section 4.4, Lisbon, Oporto and Faro airports were attributed the weights of 50%, 28,57% and 21.43% in PESA – GBA model, respectively.

Figure 7 and figure 8 evidence the collected data of table 2.

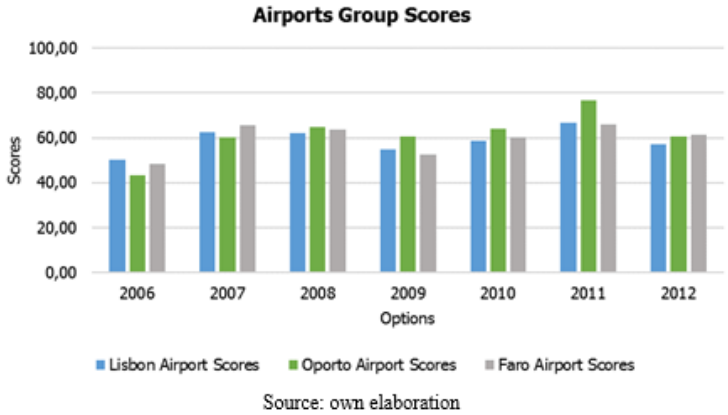


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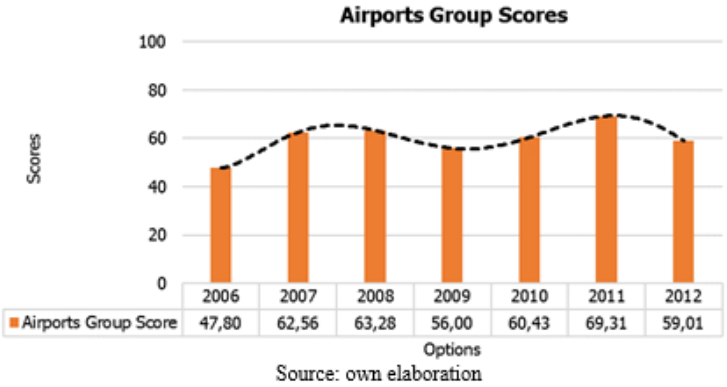
Figure 7 | Lisbon, Oporto and Faro airport value scores (considering all 6 KPA's)

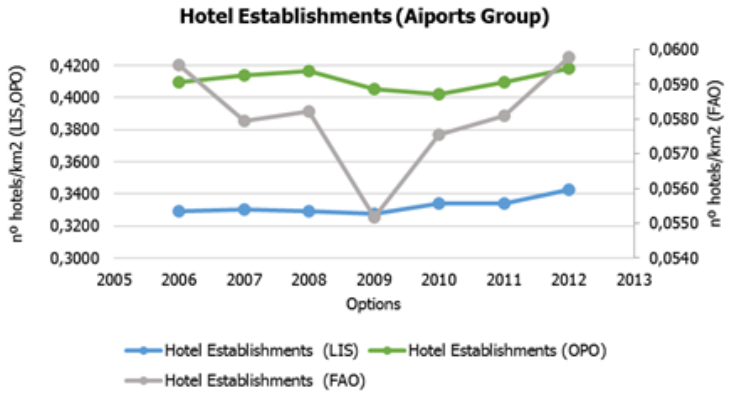


Source: own elaboration

Figure 8 | Airports group value score (considering the 3 airports).

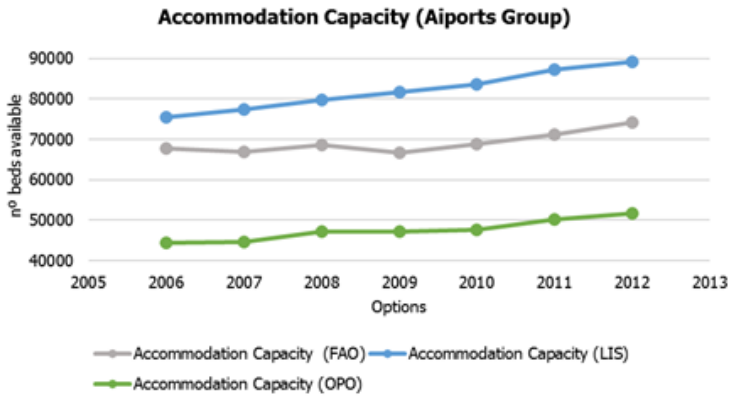
Figure 8 identifies a correlation between LCC's operation and airport performance, since the airport performance score also depicts the decrease in the same time period as LCC's passengers and movements, that is, 2009 and 2012. Next step is the identification of possible impacts of this variation in the airports hinterland tourism sector.

The next figures evidence the three tourism indicators identified in section 4.3: Hotel Establishments (Figure 9), Accommodation Capacity (Figure 10) and Occupation Rate (Figure 11), respectively.



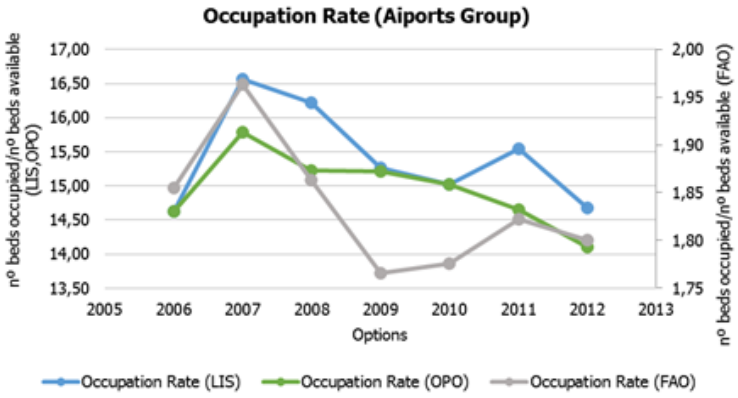
Source: own elaboration

Figure 9 | Hotel establishments from Faro (FAO), Lisbon (LIS) and Oporto (OPO) airports hinterland



Source: own elaboration

Figure 10 | Hotel establishments from Faro (FAO), Lisbon (LIS) and Oporto (OPO) airports hinterland



Source: own elaboration

Figure 11 | Occupation rate from Faro (FAO), Lisbon (LIS) and Oporto (OPO) airports hinterland.

Although the number of hotel establishments decreased, the number of beds available increased. Accommodation capacity indicator seems not to be affected or have any correlation with the LCC's passengers and movements variation, showing a steady growth during the time period studied. Nevertheless, hotel establishments and occupation rate indicators showed a clear decrease in the same time period (2008-2009) identified as for the analysis of LCC's traffic evolution and airport performance of Faro, Lisbon and Oporto.

After notice a similarity of LCC's passengers and movements, and airport hinterland hotel establishments and occupation rate, an evolution analisis of those indicators was performed at airports group level by aggregating all data from Faro, Lisbon and Oporto. Figure 12 shows this variation.

Source: own elaboration

Figure 12 | Aggregated occupation rate and hotel establishments of airports group hinterland.

Comparing Figure 12 with Figure 4, Figure 5, Figure 6 and Figure 8 it's possible to observe similar tendencies evidencing a decrease in value and scores in 2008-2009 time period. This indicates possible correlations among the analysed indicators, wich will deserve a deeper aproach.

6. Conclusion and future work

The case study evidences a possible impact on tourism sector of Faro, Lisbon and Oporto airports hinterland due to changes in infrastructure performance caused by low-cost carriers' activities.

PESA – GBA model showed similar evolution of airports performance and LCC's traffic from 2008 to 2009. However, the airport performance evolution throughout the years wasn't the same for all key performance areas, which can be explain due the fact that there are some key performance indicators that aren't affected by LCC's traffic variation.

Two tourism indicators identified and analyzed in this paper (Hotel Establishments and Occupation Rate) also showed a similar tendency throughout the studied years. It's also interesting to observe that Hotel Establishments variation seems to have one year delay from Occupation Rate variation, which can be perceived by the fact that what can lead to a decrease or an increase of Hotel Establishments number is the lack or the increase of beds occupation.

This study is a preliminary one, yet it helps to structure the future work. Next steps are: (a) to investigate the areas and indicators where LCC's impact more in airport performance and its correlation with the tourism sector of its hinterland; and (b) to extend this evaluation to a wider number of hinterland socio-economic indicators including this evaluation in PESA-GBA model.

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