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The impact of tourism on airport efficiency: The Spanish case

Xosé Luis Fernández*, Pablo Coto-Millán, Benito Díaz-Medina

Department of Economics, University of Cantabria. Avda. de los Castros s/n Santander CP 39005, Cantabria, Spain

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ABSTRACT

This paper considers the impact of tourism on airports efficiency. Using stochastic frontier analysis (SFA) methods, an input-oriented distance function was estimated for a sample of 35 Spanish airports over the 2009 to 2016 period. Air transport and tourism are highly connected. Results suggest that *tourist-oriented airports* may achieve higher efficiency levels than non-touristic ones. We also demonstrate a relationship between airline business models for tourist arrivals and airport efficiency. Airports with higher shares of "low-cost carrier" passenger traffic appear to perform more efficiently. By comparison, airports with higher shares of “charter passenger” traffic appear to perform less efficiently.

1. Introduction

Air transport is an indispensable element of tourism, providing the fastest link between the tourist population and their destinations. Currently, more than 70% of international tourists reach their destinations by air (Air Transport Action Group, 2017). The two main components of an average tourist's budget are accommodation and the airfare (Assaf and Josiassen, 2012). The arrival experience of tourists significantly influences the service-quality image of destination airports (Castillo-Manzano, 2010).

The development of air transport and tourism are heavily interdependent, and this relation is taken into account either implicitly or explicitly in the business models of both sectors (Bieger and Wittmer, 2006). Thus, commercial air transport is primarily determined by tourism, including the “low-cost" passenger model and the “charter” passenger model.

Here we take a closer look at the relationship between tourism destinations and air transport efficiency to fill some gaps in the literature. There are few articles in transport journals that approximate the effect of tourism, just as there are few references to transport in tourism journals. Moreover, to the best of our knowledge, there has been little research on the impact of tourism on the efficiency of airports.

1.1. Tourism and air transport: the Spanish context

Spain has been ranked as the third most popular global destination according to the United Nations World Tourism Organisation (UNWTO, 2017), and is thus one of the major tourism powers in the world. In 2015–2016, Spain also led the world in tourism growth.

One of the principal reasons why tourists visit Spain is the “sun and beach” appeal. The most popular Spanish mainland coasts are found on its Mediterranean side and the Canary Islands (83% of the total tourist in 2016). According to the National Geographical Institute of Spain, the areas with the highest touristic demand are those of Costa Brava, Costa Dorada, Costa Blanca, Costa del Sol, Baleares, and the Canary Islands. Mediterranean tourism is strongly seasonaedl, while tourism on the Canary Islands is unaffected by season, and is homogeneously distributed throughout the year.

According to the Survey of Tourist Movements at Frontiers (Frontur), in 2016, Spain received 75,563,198 tourists from abroad and among them, 60,582,406 (80.2%) arrived by air (in 2009, the first year considered in our research, Spain received 52,177,640 tourists). The rate of foreign national passengers in the Spanish network is considerably high (66% of total passengers for the period 2009–2016).

Aeropuertos Españoles y Navegación Aérea (Spanish Airports and Aerial Navigation) (AENA) is the largest airport operator in the world, managing 46 airports, and two heliports. In 2013, the Spanish government decided to privatise AENA. The aim of the privatisation was to *reinforce the management of AENA, to guarantee the future sustainability of the Spanish airport system, and to stimulate the efficiency of the Spanish transport sector and other linked strategic sectors, including tourism.*[1] In this context, airports are considered as mature ‘firms' that should be able to operate on a stand-alone basis without government support or interference.

* Corresponding author.
E-mail addresses: fernandezxl@unican.es (X.L. Fernández), cotop@unican.es (P. Coto-Millán), benitodm90@gmail.com (B. Díaz-Medina).

[1] Extracted from the report published by Spanish Privatisation Consulting Council (SCCP), on the design of the privatisation process of AENA (21 October 2013). http://www.ccp.es/archivos/oinf_27.pdf.

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This paper aims to contribute to the understanding of the interrelation between tourism and air transport in two aspects:

First, we evaluate the impact of tourism on airport efficiency. This question has been of great interest, given the growing social and economic relevance of the sector in recent decades.

Second, we aim to evaluate the relationship between airline business models and airport efficiency. To this end, we compare the efficiency of airports under two management models related to tourism: the low-cost passenger model and the charter passenger model.

A review of the literature on airport efficiency is available in the following section. The third section presents the empirical model to be estimated. The fourth section describes data and presents descriptive statistics of the variables used. The corresponding results are presented in the fifth section. Finally, section six offers the conclusions of this research.

2. Literature review

A comprehensive body of literature focuses on issues of airport efficiency and productivity. As observable in the early works, the question arises of whether or not airport size matters to efficiency. Most of the works found that size positively affects efficiency. This can be concluded from the works of Hooper and Hensher, 1997, Gillen and Lall., 1997, Murillo-Melchor (1999), Salazar (1999), Pels et al. (2003), Tapiador et al. (2008), and Pestana and Dieke, 2008, Perelman and Serebrisky (2010), Martın and Voltes-Dorta, 2011, Lozano and Gutierrez, 2011, Hong Kan Tsui et al. (2014) Coto-Millán et al. (2014) and Abbott (2015). Exceptions were found by Abbott and Wu, 2002, Bazargan and Vasigh (2003), and Pestana (2008). Pestana (2008) concluded that the diversity of UK airports makes medium airports more efficient than larger ones. Abbott and Wu, 2002 found no significant relationship between size and efficiency. Bazargan and Vasigh (2003) found a negative correlation between size and efficiency. Finnaly, Tovar et al. (2010) concluded that “hub” airports appear more efficient, but found no relationship with the size of the airport.

Based on the available research, there is no consensus on the role of privatisation in airport performance. Pels et al. (2003), Oum et al. (2006), Merkert and Assaf (2015), and loStorto (2018) found a positive effect of privatisation on operational performance. Other scholars (Parker, 1999; Lin and Hong, 2006; Vogel, 2016) found no effect. Finally, Oum et al. (2006), Scotti et al. (2012) and Martini et al. (2013) found a negative effect of airport privatisation on operational performance.

Recently, there has been some interest in the impact of low-cost carriers (LCCs) on airport efficiency. On this issue, there is a preconceived idea that “low-cost" tourists are “occasional backpackers” that negatively affect airport revenues (Fernández, 2011). This perspective is based on claims the increased volatility and lower spending by tourist passengers against other types of passengers (Mason, 2015). On this subject, Bottasso et al. (2012) for British airports, and Coto-Millán et al. (2016b), for Spanish airports, concluded that the impact of “low-cost" traffic on airport efficiency is positive. By contrast, a study by Choo and Oum (2013) for US airports during the period 2007–2010 concluded that the impact of “low-cost" airlines is negative for the efficiency of airports.

Many other variables can impact the efficient operation of airports. Non-aeronautical revenues have been shown to contribute to higher efficiency scores (Tovar and Martín-Cejas, 2009). Geographical locations and airport business models are also expected to determine the level of competition and hence the efficiency and profitability of airports (Merkert and Mangia, 2014).

Transport infrastructure constitutes a necessary enabling factor for areas that are characterised by a tourism vocation and has an essential role in supporting and enhancing this economic activity (Brida et al., 2014). Nevertheless, few studies have explored the extent to which tourism affects transport efficiency. Barros (2014) analysed airport efficiency in Mozambique from 2000 to 2012 and outlined a series of policy recommendations (including tourist strategies) to cope with the frontier of best practices. Fragoudaki and Giokas (2016) found that airport connectivity and hotel infrastructure positively affect airport performance. Finally, Pavlyuk (2016) highlighted the importance of tourism flows for airports on the south coast of Europe. Given these shortcomings, our research aims to contribute to the economic literature on air transport by evaluating the efficiency of airports regarding its tourist orientation.

3. Theoretical and empirical model

The different approaches to efficiency measurement could be broadly divided into two groups according to the method chosen to estimate the technological frontier, namely, Data Envelopment Analysis (DEA) versus stochastic frontier analysis (SFA). Although most airport efficiency studies use DEA, we believe that the SFA has advantages. SFA allows the inefficiency effect to be separated from the statistical noise. Furthermore, SFA allows statistical inference in the significance of the variables included in the model. Finally, SFA allows random unobserved heterogeneity among the different airports.

Technical efficiency is a measure to obtain the maximum possible output given certain quantities of inputs and productive relationships. The distance function (Shephard, 1962), allows estimation of the relative efficiency of airports by taking into account the technological frontier described. Moreover, the distance function provides an estimation of multi-output processes.

Distance functions can be either input or output oriented. The choice of an input-oriented distance function can be explained by market conditions (Coto-Millán et al. (2016a)). The state-owned corporation “AENA Aeropuertos” do have control over inputs, such as labour, capital, and intermediate consumption, but do not have control over the output (passengers, cargo, movements, etc.).

An input-oriented distance function is defined as:

$$D_I(x, y) = max_\delta\{\delta : (x/\delta)\ \varepsilon\ L(y)\} \tag{1}$$

Where y is a vector of M outputs, x represents a vector of N factors and $L(y)$ the input set, which defines the groups of all inputs, x, that can be used to obtain the output vector, y. . The value of the distance function is less than or equal to one. On the outer boundary of the production possibilities set, the value of $D_I(x, y)$ is equal to one.

Using the Translog[2] functional form for the production technology, with M outputs and K inputs in the year t, the following relation exists:

$$\begin{aligned} \ln D_{Iit} = {} & \alpha_i + \sum_{r=1}^{M}\beta_r \ln y_{rit} + \frac{1}{2}\sum_{r=1}^{M}\sum_{s=1}^{M}\beta_{rs}\ln y_{rit}\ln y_{sit} + \sum_{j=1}^{K}\gamma_j \ln x_{jit} \\ & + \frac{1}{2}\sum_{j=1}^{K}\sum_{h=1}^{K}\gamma_{jh}\ln x_{jit}\ln x_{hit} + \frac{1}{2}\sum_{r=1}^{M}\sum_{j=1}^{K}\rho_{rj}\ln y_{rit}\ln x_{jit} + t_1\tau + t_2\tau^2 \\ & + v_{it} \quad \alpha_i = \alpha + w_i, \quad w_i \sim N\left(0, \sigma_W^2 \quad i = 1, \ldots, N \quad and \quad t \right. \\ & = 1, \ldots, T \end{aligned} \tag{2}$$

where D_I is the input-oriented distance function, y is the r output vector, x is the j input vector, τ is a time trend, i relates to the airport and t relates to the time period. y_{rit-1} is the one-period lagged output vector. β_r, α_r, β_{rs}, γ_j, γ_{jh}, ρ_{rj}, t_1 and t_2 are parameters to be estimated. Following Aigner et al. (1977), v_{it} is a symmetric error term, independent and identically distributed (*iid)* with a zero mean representing a random variable that cannot be controlled by the Airport operator.

[2] The likelihood ratio (LR) test has been used to identify whether the Cobb–Douglas functional form, or the translog specification, was the most adequate.