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Small regional airport sustainability: Lessons from benchmarking

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A B S T R A C T

Small and regional airports frequently suffer from limited traffic given minimum fixed infrastructure requirements and insufficient revenues to cover their costs. The question is whether such airports could be structured, managed and possibly financially supported in order to survive efficiently. Efficient operations contribute to decreasing the financial dependency of airports on subsidies or the likelihood of foreclosure. This paper applies data envelopment analysis, assuming that the aeronautical output is exogenous, in order to estimate the relative efficiencies of a set of 85 European regional airports over the last decade. We estimate the potential savings and revenue opportunities to be in the order of 50% and 25% respectively because cost increases were in excess of any changes in demand over the timeframe. Using second stage regressions we examine the reasons for poor performance, which include discretionary variables such as the failure to search for commercial opportunities or to produce ground-handling and fueling activities in-house. We also note that belonging to an airport system reduces efficiency in the order of 5%. Finally, the break-even passenger throughput over the last decade more than doubled to 464 thousand, however airports behaving efficiently could have covered their annual operating budget with a mere 166 thousand passengers annually.

1. Introduction

Small regional airports provide the infrastructure necessary to enable mobility in remote areas. In regions such as Alaska, Northern Canada, the interior of Australia and Northern Scandinavia, such access is critical because road provision is often problematic during the winter or rainy season. Due to sparse population densities in such areas, airline service may be difficult to justify from a purely economic perspective (Graham et al., 2010). Various countries around the globe have chosen a regional policy that encourages the population to remain in remote areas, hence for reasons of education and health care access, tourism promotion and work opportunities, it may be necessary to subsidize such systems in order for airline service to continue (Halpern and Brathen, 2011). Consequently, the small regional airports in remote areas rely on an artificially created demand by governments or civil aviation authorities. These services are referred to as Public Service Obligations (PSO) in Europe,[1] Regional Aviation Access Programs (RAAP) in Australia and Essential Air Services (EAS) in North America.[2] Air carriers receive subsidies in order to serve the pre-determined, scheduled routes (Williams and Pagliari, 2004). In the European Union there were more than 220 PSO routes and in the US there were around 140 EAS routes in 2007 (Graham et al., 2010).

The airports that serve small communities require a minimum level of basic infrastructure to serve small aircraft, namely a minimum 800 m runway, to serve the low passenger throughput. 340 out of the 491 airports in Europe[3] served less than 1.5 million passengers in 2007 (Eurostat, 2009). In order to ensure the economic viability of such infrastructure, various approaches to airport ownership have been applied across Europe, from local or federal government ownership to airport commercialization through medium term contracts up to complete privatization. For example, the Norwegian government corporatized the majority of Norwegian airports in 2003 under the umbrella of a single, 100% publicly owned company called Avinor. In this system, the four largest airports cross-subsidize the remaining 42 airports and the government in addition, subsidizes the public service obligation routes.[4] In the U.K., after a gradual privatization process, some small airports have subsequently stopped serving commercial traffic such as Plymouth airport which closed in 2011 after citing insufficient

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[1] The current list of PSO routes in Europe can be found at: http://ec.europa.eu/transport/modes/air/internal_market/pso_en.htm.

[2] However, it should be noted that some routes are served both by commercial air carriers and PSO carriers simultaneously.

[3] Europe in this context includes the European Union, Croatia, Turkey, Iceland, Norway and Switzerland.

[4] Widerøe, a fully owned subsidiary of SAS airlines, dominates the PSO market, with DAT and Danish Air Transport offering a few routes too.

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demand as the cause and the Peel Corporation which is now trying to sell its 75% ownership in Durham-Tees Valley airport for similar reasons. Therefore, we investigate the passenger levels necessary to achieve a break-even point, the levels of efficiency attainable given the minimum, necessary infrastructure required to serve as an airport and the form of ownership that would minimize subsidies such that the system survives and offers reasonable levels of service.

Structural changes in the air transport industry over the past quarter of a century have led to an increasing interest in airport benchmarking. Although there are a wide range of airport benchmarking studies for large airports and in particular hubs, much less has been investigated at the local and regional level. A significant relationship has been found between levels of efficiency and airport size in the airport benchmarking literature. Sarkis (2000) compares hub airports from the US with non-hub counterparts using data envelopment analysis models and presents evidence of higher efficiency levels at hub airports. Oum and Yu (2004) conclude that larger airports achieve higher efficiency scores based on a variable factor productivity analysis of 76 airports around the world. Assaf (2009) applies a stochastic frontier analysis to two groups of airports in the UK and shows that the large airports are technically more efficient. Yoshida and Fujimoto (2004) analyze Japanese airports through data envelopment analysis and endogenous weight total factor productivity, followed by a second stage tobit regression and conclude that the regional airports in Japan are relatively less efficient. Relative inefficiency of smaller airports may be explained by low traffic demand relative to the minimum infrastructure necessary to produce safe and secure traffic movements. As a result the costs incurred per movement are substantially higher than their larger airport counterparts and were the prices set such that they covered the full cost of the facility, there would be few to no users. As a result, financial aid seems inevitable in order to sustain services if deemed necessary. The form and level of financial aid required will depend on various factors, including the need for new investments and maintenance requirements of the existing infrastructure as well as the geographic location, pricing policies, regulatory structure and ownership form of the airport. Financial aid frequently takes one of two forms; the airports either receive direct financial subsidies from the local or federal governments or they are cross-subsidized by the profits of other airports that belong to the same company or airport authority. Whether the type and level of subsidies play an important role in the subsequent efficiency measure would appear to be an interesting question. The literature analyzing this relationship suggests that subsidies act as a negative influence on the efficiency of firms (Cowie, 2009), but the causal relationship is somewhat problematic. Moreover, airport security regulations have grown stricter in light of the 9/11 terrorist attacks in 2001, which have incurred additional fixed and operational costs. Although the costs of security are partially or fully passed on either to the taxpayer or passenger, they have a negative effect on the demand for and supply of air traffic services. According to our analysis, covering 85 airports across Europe, airports serving approximately 200,000 passengers annually were in a position to cover their operational costs in terms of earnings before interest and taxes in 2002. On the other hand, at least 464,000 passengers annually were necessary to achieve the operational break-even point by 2009.

Although small airports might not cover the costs of operations due to the limitations described, it is equally important that subsidies are not squandered. Principally, staffing levels, outsourcing and material purchases are directly influenced by airport management. Furthermore, non-aeronautical revenues may be possible with improved pricing or marketing strategies. Oum et al. (2008) argue that "*an efficient airport provides important economic catalysts that enable the local and regional economy to thrive and improve the quality of life in the region*". Hence, airport managers, airport operators, civil aviation authorities and governments should assess the efficiency of regional airports and determine the reasons for inefficiencies. The paper is organized as follows; Section 2 provides an overview of the literature on airport benchmarking and Section 3 presents the methodologies applied in this research. The data and variables are discussed in Section 4, Section 5 presents the results and concluding remarks are drawn in Section 6. The Appendix lists the 85 European airports that were analyzed in the course of this research.

2. Literature review

Airport benchmarking studies generally utilize multidimensional analyses such as total factor productivity (TFP), stochastic frontier analysis (SFA) and data envelopment analysis (DEA) in order to estimate overall productivity measures. TFP is an index approach based on a ratio of the weighted sum of outputs to the weighted sum of inputs. Extensive data requirements, including the quantities and prices of both inputs and outputs, causes difficulties in the implementation of such an analysis. SFA is a parametric method, where a functional form of the relationship between inputs and outputs and the inefficiency term must be assumed a-priori (Coelli et al., 2005). A distance function needs to be estimated instead of a production function in the case of multiple outputs, which is common in airport benchmarking studies (Assaf, 2009, 2010a; Assaf and Gillen, 2012; Oum et al., 2003; Pels et al., 2001, 2003; Tovar and Martin-Cejas, 2009, 2010). DEA is a nonparametric approach that computes the relative efficiency of decision-making units based on a weighted index of outputs divided by the weighted index of inputs. The weights themselves are the decision variables in the linear program that estimates efficiency scores, targets and benchmarks. The advantage of DEA over the previous two methodologies draws from the reduced set of assumptions required at the expense of weaker results. DEA categorizes the observations into two groups, those that are efficient and those that are not, but does not rank the units as do SFA and TFP.

DEA has been applied in multiple airport studies over the last 15 years, beginning with Gillen and Lall (1997). The vast majority of the research on airport benchmarking using DEA has implemented the radial, constant or variable returns-to-scale models, which assume proportionate input reductions or output increases. Adler and Berechman (2001), Fernandes and Pacheco (2002), Martín and Román (2006) assume variable returns-to-scale in airport operations, whereas Bazarghan and Vasigh (2003), Fung et al. (2008), Sarkis and Talluri (2004) employ the constant returns-to-scale model. Furthermore some research utilizes both specifications permitting an analysis of both technical and scale efficiencies (Abbott and Wu, 2002; Assaf, 2010b; Martín and Román, 2001). On the other hand, non-radial DEA models incorporate all slacks into a single efficiency measure but their implementation in airport efficiency studies to date has been rare. Lozano and Gutiérrez (2011a) compute the Russell measure of technical efficiency by implementing a non-radial DEA model and Lozano and Gutiérrez (2011b) implement a slack-based measure to analyze Spanish airports which incorporates the effects of an undesirable output into the efficiency measure. While some analyses develop an input-oriented DEA model assuming that the main output, namely traffic, is exogenous and cannot be impacted by airport management (Abbott and Wu, 2002; Adler and Berechman, 2001; Pels et al., 2003), others focus on output maximization assuming that the inputs, including runways and terminals, are fixed in the short run (Gillen and Lall, 1997; Martín and Román, 2006; Yu, 2004). Adler et al.