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Technical efficiency and productivity changes in Spanish airports: A parametric distance functions approach

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ABSTRACT

This paper contributes to the airport benchmarking literature in two ways. To our knowledge, this is the first attempt at using a stochastic distance function to measure airports' productivity changes while considering multiple outputs. Secondly, we calculate the evolution and decomposition of the Total Factor Productivity (TFP) for Spanish airports. The average rate of productivity showed a slight annual improvement of 0.9%, and the core engine of this was 3% increase in technical progress rather than through efficiency. Results, by airport, identify those needing improvement, to be more attractive in the Spanish airport restructuring program.

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1. Introduction

An airport is more than a mere interchanger of transport modes; it is a system that serves a wide and complex range of needs related to the movements of people and items worldwide. A performance measurement of the airport industry becomes crucial, to guarantee that those services are provided correctly. However, the evaluation of airport performance has been, for quite some time, neglected by transport research. Recently, a wide variety of airport studies have been carried out, in order to fill this gap in transport literature; see Table 1 in Section 2.

One reason for the recent interest in airport performance could be the worldwide trend towards airport privatization. This privatization process makes the evaluation of performance in order to ensure that resources are used effectively. Governments have to verify that the best use is made of national resources, and that airports provide the required services at a fair price without taking advantage of their monopolistic or quasi-monopolistic position.

Spain has a centralized network of state ownership airports. AENA is the public business body entrusted with the planning, development, building, installation, operation and management of all the 47 airports included in the Spanish Network. Recently, the Government of Spain announced that AENA will be restructured in two ways. Regional governments will participate in the management of airports located within their territories and private companies will also take part.

Some argue that the airports should be ceded entirely to Spain's autonomous regional governments, which would mean the disappearance of AENA. The Government's intention seems to be that AENA retains day to day management, and that regional officials will participate in key planning decisions; for example commercial space allocation, infrastructure investment, and so on.

Although details regarding the participation of private companies are not yet known, the reform does not seem to be oriented towards full privatization. On the contrary, the Government's intention seems to be to allow private companies buy up to 49% of the shares of AENA, so the airports are kept under public control.

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Table 1
Summary of airport performance studies.

Year	Authors	Methodology			Measures	Data	Observations
		Frontier?	Parametric?	Model			
1997	Gillen and Lall (1997)	Yes	No	DEA	TE	21 USA airports (1989/1993)	Explain ET through Tobit
	Hooper and Hensher (1997)	No	No	PIN	TFP	5 Australian airports (1988/89–1991/92)	Estimate two regression models for estimating output adjusted-TFP
1999	Salazar (1999)	Yes	No	DEA	CE	16 Spanish airports (1993/1995)	
	Parker (1999)	Yes	No	DEA	TE	22 UK airports (1988/89–1996/97)	
	Murillo-Melchor (1999)	Yes	No	DEA	TE, TFP	33 Spanish airports (1992/1994)	Use a Malmquist index (and decompose it)
2000	Sarkis (2000)	Yes	No	DEA	TE	44 USA airports (1990/1994)	ET scores are analyzed using Mann–Witney test
	Nyshadham and Rao (2000)	No	No	PIN	TFP	25 European airports (1995)	Use a translog Multilateral index
2001	Adler and Berechman (2001)	Yes	No	DEA	TE	26 Worldwide airports (1996)	Use principle component analysis and applied superefficient DEA model
	Pels et al. (2001)	Yes	No	DEA	TE	34 European airports (1995/1997)	
		Yes	Yes	SPF	TE		Use a Cobb–Douglas function
	Martín and Roman (2001)	Yes	No	DEA	TE	37 Spanish airports (1997)	
	Gillen and Lall (2001)	Yes	No	DEA	TE, TFP	22 USA airports (1989/1993)	Use a Malmquist index (and decompose it)
2002	Abbott et al. (2002)	Yes	No	DEA	TE, TFP	12 Australian airports (1989/90, 1999/2000)	Malmquist index (and decompose it), explain TFP's variations through Tobit
	Fernandes and Pacheco (2002)	Yes	No	DEA	TE	35 Brazilian airports (1998)	
	Martín-Cejas (2002)	Yes	Yes	DCF	TE	40 Spanish airports (1996–1997)	
2003	Bazargan and Vasigh (2003)	Yes	No	DEA	TE	45 USA airports (1996–2000)	ET scores are analyzed using Kruskal–Wallis and Mann-Witney tests
	Oum et al. (2003)	No	Yes	EW-TFP	TFP	50 World airports (1999)	Further analyzing TFP by regression models
	Pels et al. (2003)	Yes	No	DEA	TE	34 European airports (1995/1997)	
		Yes	Yes	SPF	TE		Use a Translog function and explain de inefficiency
2004	Yoshida et al. (2004)	Yes	No	DEA	TE	67 Japanese airports (2000)	Explain ET through Tobit
		No	Yes	EW-TFP	TFP		Explain ET through OLS
	Oum and Yu (2004)	No	Yes	EW-VFP	VFP	76 Worldwide airports (2000–2001)	Further analyzing VFP by regression models
	Barros and Sampaio (2004)	Yes	No	DEA	TE, AE	13 Portuguese airports (1990–2000)	Explain CE through Tobit
	Yu (2004)	Yes	No	DEA	TE	14 Taiwan airports (1994–2000)	Undesirable (noise) are taken into account
	Sarkis and Talluri (2004)	Yes	No	DEA	TE	44 USA airports (1990–1994)	
	Pathomsiri and Haghani (2004)	Yes	No	DEA	TE	63 Worldwide airports (2000, 2002)	Use paired-sample *t*-test to test differences in ET scores before/after September-11
	Yoshida (2004)	No	Yes	EW-TFP	TFP	30 Japanese airports (2000)	Further analyzing TFP by regression models
2005	Pathomsiri et al. (2005)	Yes	No	DEA	TFP	72 Worldwide airports (2000, 2002)	Parametric and non-parametric test to test ET differences before/after September-11

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